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Spatial Dimension of Change in Agricultural Land Use and Impact on Crop Production in Turkey

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Turkey has been undergoing very important economic and social changes since several decades such as economic growth, privatization of state enterprises, liberalization, and integration with the EU, and legislative reforms. All sectors in Turkey and production levels are affected by these changes during the years. Crop production in agriculture is one of the most affected sectors. Many policies by governmental/nongovernmental organizations have been applied and supported for the development of the sector such as modernization, mechanization, irrigation, road constructions, potable water, financial supports, agricultural insurance, and technical supports. Therefore, the main purpose of this paper is to look back and analyze the trend of agricultural changes, land use and related production levels in Turkey.

Key words: *land use, area harvested, crop production, agriculture, cereals, Turkey*

1 INTRODUCTION

Turkey is surrounded by the Black Sea to the north, the Sea of Marmara and Aegean to the west, and the Mediterranean Sea to the south. Various mountain ranges have continuously located in coastal areas, and inland is the plateau. Turkey is geographically classified into seven regions. However, the present study examines the regional and temporal differences of Turkish agriculture based on unit areas which has been adopted in the EU countries (**Fig.1** and **Table 1**). The main purpose of this paper is to look back on the trend of agricultural land use and food production in Turkey. Then, we examine the existing relevant researches.

While using a dot map, Erinç, S. and Tunçdilek, N. (1952) mapped in considerable detail the distribution of many crops such as wheat, barley, rye, maize, oats, legumes, potatoes, cotton, sugar beets, grapes, citrus fruits, olives, tobacco, and hazelnuts. They divided Turkey into 6 major agricultural regions. The major regions were sub-divided into several minor regions, respectively. The characters of the regions were explained in terms of climate and cultivation of main crops.

Komatsu, E. (1990) described the temporal change of agriculture and animal husbandry from 1950 to the mid-1980s using the production data of wheat, barley, corn, tobacco, grapes, cotton, sugar beet, tea, sunflower, and bean, the area of arable land and fallow, the number of tractor, and a population of

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chicken, cattle, sheep, and Angola goat. In grain production, the increase of wheat and barley were particularly noticeable after the 1970s and the increase in corn was particularly noticeable after the 1980s. The production of cotton was significantly increased after 1960. Tobacco increased from the mid-1960s until 1980, afterwards it decreased. Although the production of grapes was increased from 1950 to the early 1970s, then it stagnated and declined. Tea and sunflower had consistently increased dramatically since 1960. Although the production of sugar beet was steadily increased from 1950 to 1960, then it decreased, and it increased again after 1970. He pointed out main production areas for each crop; however, the spatial study of production is generally insufficient. This study examines the trend of agricultural production after the 1990s and clarifies the spatial difference of agriculture as much as possible.

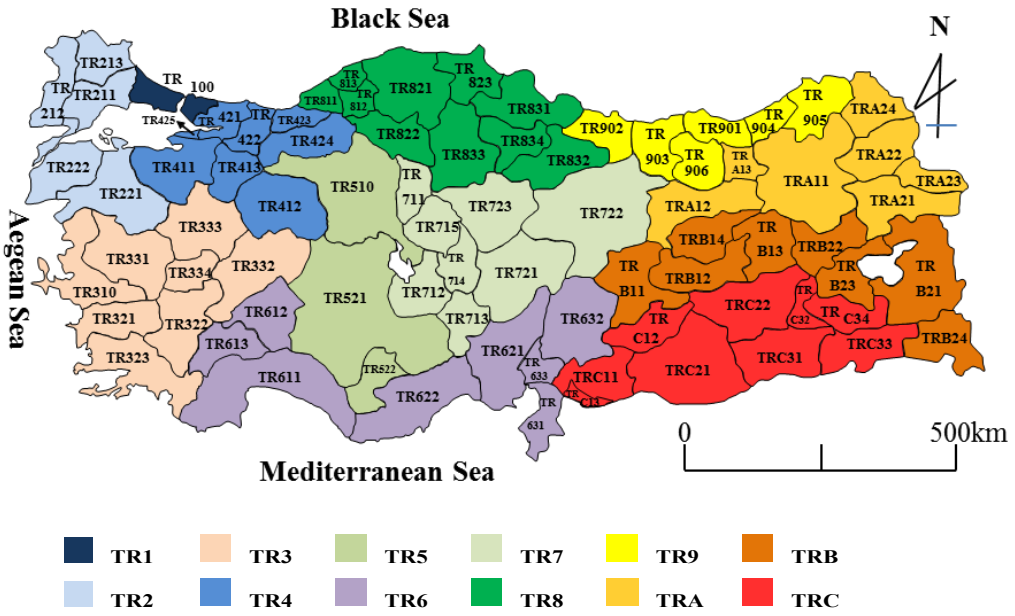


Fig.1 NUTS level-1 and level-3 regions in Turkey

Table 1 Codes and descriptions of NUTS level-3 regions

Code	City	Code	City	Code	City	Code	City	Code	City
TR100	İstanbul	TR413	Bilecik	TR633	Osmaniye	TR832	Tokat	TRB11	Malatya
TR211	Tekirdağ	TR421	Kocaeli	TR711	Kırıkkale	TR833	Çorum	TRB12	Elazığ
TR212	Edirne	TR422	Sakarya	TR712	Aksaray	TR834	Amasya	TRB13	Bingöl
TR213	Kırklareli	TR423	Düzce	TR713	Niğde	TR901	Trabzon	TRB14	Tunceli
TR221	Balıkesir	TR424	Bolu	TR714	Nevşehir	TR902	Ordu	TRB21	Van
TR222	Çanakkale	TR425	Yalova	TR715	Kırşehir	TR903	Giresun	TRB22	Muş
TR310	İzmir	TR510	Ankara	TR721	Kayseri	TR904	Rize	TRB23	Bitlis
TR321	Aydın	TR521	Konya	TR722	Sivas	TR905	Artvin	TRB24	Hakkari
TR322	Denizli	TR522	Karaman	TR723	Yozgat	TR906	Gümüşhane	TRC11	Gaziantep
TR323	Muğla	TR611	Antalya	TR811	Zonguldak	TRA11	Erzurum	TRC12	Adıyaman
TR331	Manisa	TR612	Isparta	TR812	Karabük	TRA12	Erzincan	TRC13	Kilis
TR332	Afyonkarahisar	TR613	Burdur	TR813	Bartın	TRA13	Bayburt	TRC21	Şanlıurfa
TR333	Kütahya	TR621	Adana	TR821	Kastamonu	TRA21	Ağrı	TRC22	Diyarbakır
TR334	Uşak	TR622	Mersin	TR822	Çankırı	TRA22	Kars	TRC31	Mardin
TR411	Bursa	TR631	Hatay	TR823	Sinop	TRA23	Iğdır	TRC32	Batman
TR412	Eskişehir	TR632	Kahramanmaraş	TR831	Samsun	TRA24	Ardahan	TRC33	Şırnak
								TRC34	Siirt

2 POPULATION AND LAND USE

In the chapter, at first, we examine population trend and agricultural land-use.

2.1 Population

In the section, we study population, GDP, and agricultural population in Turkey. According to the 2012 statistics of FAO, the area of Turkey is 78,356 (10^3 ha) and about twice of Japan (the area is 37,796). On the other hand, since the population of Turkey is 74,933 (thousand), it is about 59% of Japan (127,144 (thousand)) in 2013, United Nations statistics. The population of Turkey was 53,995 (thousand) in 1990 and the one in 2013 was 74,933, therefore, it would increase by approximately 39%. The population of Turkey is sure to increase from now on if we take population structure into consideration.

Fig.2 draws the population distribution in 2000. Among 81 areas, the population of 18 areas surpasses 1 million people. The population of Istanbul area is 10,020,000 people and is the most. The population of Ankara area is about 4 million people of the second most crowded. The population in 16 areas are under 250,000 and 23 areas are between 250,000 and 500,000 is equivalent near about half of total level-3 regions. According to this situation, there are a lot of regional differences of the population.

As the Turkish nominal GDP was 822,149 (million US dollars), it was in the 18th position in the world in 2013. However, since the per capita nominal GDP is 10,972 (US dollars), it was in the 83th position in the world in the same year. The per capita nominal GDP of Turkey in 1990 was 3,751 (US dollars). It continued to increase and it became 10,972 in 2013. Therefore, it would be increased to about three times. From the above, Turkey has a very large potential for development in the future. If the country's economy develops, it also affects significantly to food production.

Although the rate of agricultural employment in Turkey was 60% in 1980, it gradually continued to decrease and became 50% or less in 2000. Nevertheless, the rate was greater than the one of other industries (**Table 2**). Agriculture is still the key industries of this country. The employment rate of industry, construction, and service industry has increased over time. The rate of agricultural employment in 2000 is generally low in the western area of Turkey and high in the central and eastern part of the country (**Fig.3**). However, the regional difference of the employment rate of agriculture is never small. The rate is 70% or more in 18 areas and it shows the level of 60% in 30 regions. The rate of Muş area (TRB22) is 83.4%, the one of Ardahan area (TRA24) is 77.8%, and Yozgat area (TR723) is 77.3%. On the contrary, the numerical value of the following areas is particularly small, the rate of İstanbul area (TR100) is 8.1%, the one of Ankara area (TR510) is 16.2%, and İzmir area (TR310) is 28.5%.

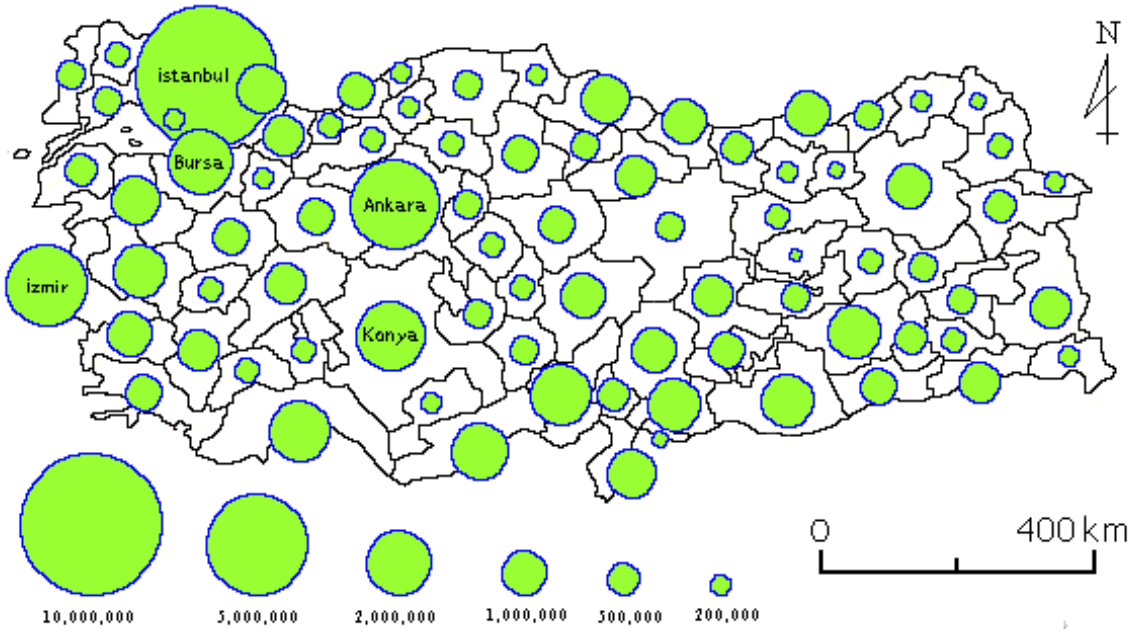


Fig.2 Population distribution in 2000

Source: Population Census in 2000 in Turkey

Table 2 Rate of employed population by economic activity, 1980-2000

	Tarım Agriculture	Sanayi Industry	İnşaat Construction	Hizmet Services	İyi tanımlanmamış faaliyetler Others
1980	60.0	11.6	4.1	23.4	1.0
1985	59.0	11.4	3.7	25.5	0.5
1990	53.7	12.8	5.1	27.9	0.6
2000	48.4	13.3	4.6	33.5	0.1

Source: Population Census in Turkey, 1980-2000

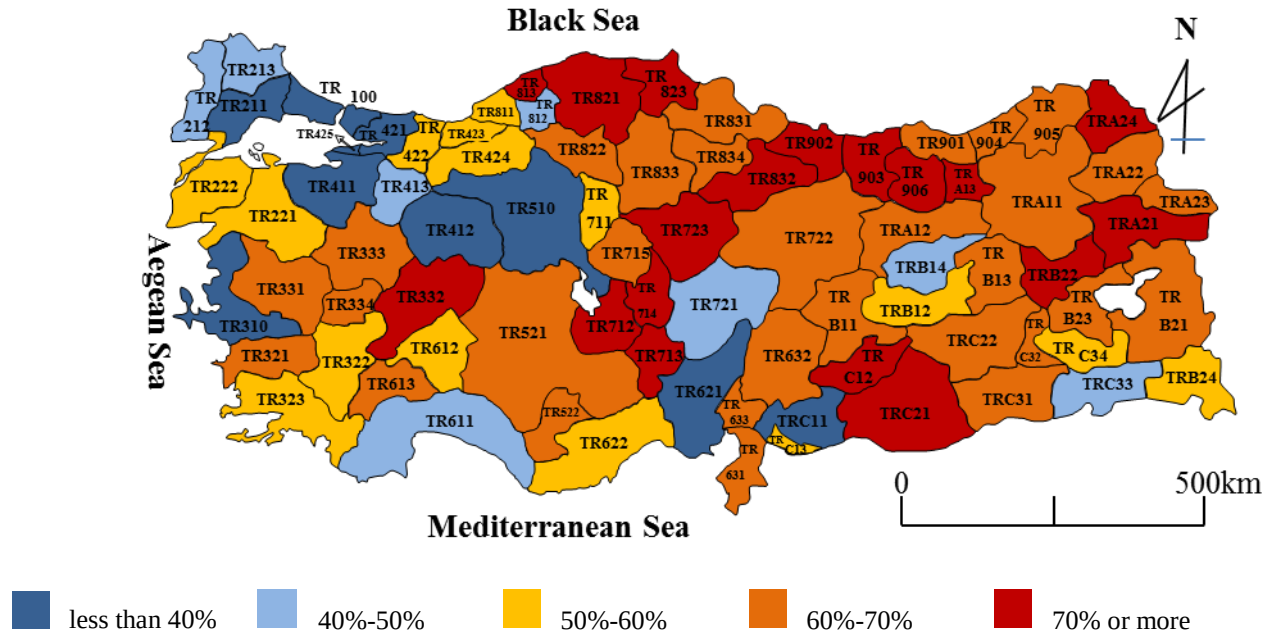


Fig.3 Rate of employed population of agriculture, hunting, forestry and fishing (%) in NUTS level-3, 2000

Source: The 2000 Census of Population in Turkey

2.2 The land-use for agriculture and forestry

We also examine agricultural land-use including forestry. The total area of land-use has experienced very few changes during the past 26 years (**Fig.4**). In 2014, the rate of forest is 35.9%, the one of sown area of crops is 26.2%, permanent meadows and pastures is 24.2%. These three totals account for about 86%. The area of forest and the land under permanent meadows and pastures slightly increased. On the contrary, the area of sown area of crops decreased. Specifically, the area of forest rose 1,479 (10^3 ha) in a quarter of century, and the land under permanent meadows and pastures rose 440 (10^3 ha). However, sown area of crops decreased 3,206 (10^3 ha) during the same period. Other than these, the rate of fallow land is outstanding and it is 6.8% in 2014. The area of fallow land of 1988 (18,995 (10^3 ha)) decreased to 15,789 (10^3 ha) in 2014. The rate of decline was 17%. The planted area of vegetables, grapes and the other fruits, and olive trees is very small among the whole.

We drew agricultural land use not including forest, permanent meadows, and pastures on **Fig. 5**. Crops except vegetables will be mainly cereals. The area of cereals decreases a little gradually. The cereals area of 1995 (1,825 (10^4 ha) was increased a little in the 20th century, but it decreased gradually after that. Its area decreased in 1,562 (10^4 ha) in 2013. The rate of decline was about 14%. The fallow area in 1995 was 512 (10^4 ha), but it had decreased a little. That was 415 (10^4 ha) in 2013. The rate of decline was 19%. The area of fruits beverage and spices crops tends to be increased a little. It was 140 (10^4 ha) in 1995, it increased to 194 (10^4 ha) in 2013. The rate of increase was about 39%. The area of vegetables, grapes and olive trees was quite small, respectively. The area of

vegetables and grapes is decreased a little and the area of olive trees is increased a little. There are more few areas of the fodder crops. Its area was 31 (10^4 ha) in 1995, but it was increased in 188 (10^4 ha) in 2013. The rate of increase was 606%.

3. CROP PRODUCTION AND ITS CHANGE

Turkish cuisine, along with Chinese and French cuisine is often referred to as the world's three major cuisines and there are unique many dishes. Therefore, in this chapter we consider the temporal and regional trends of production for typical agricultural products (except livestock products) that are used for food. By the way, the administrative organization was reorganized in June, 2011 in Turkey, but the Ministry of Food Agriculture and Livestock (MoFAL) takes the enforcement of the policy on farm and fishery businesses.

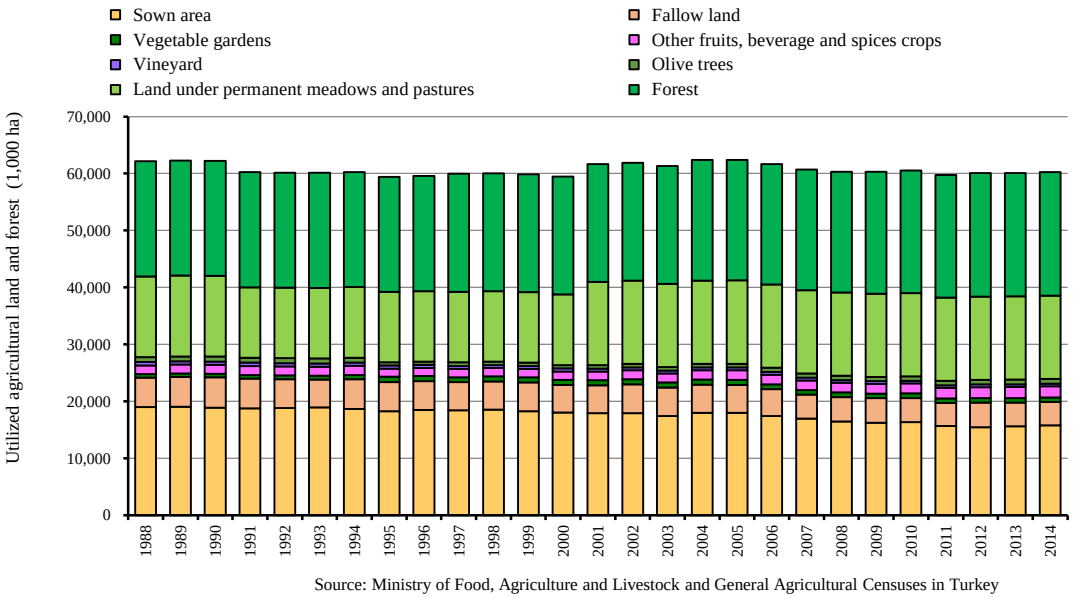


Fig.4 Utilized agricultural land and forest, 1988-2014

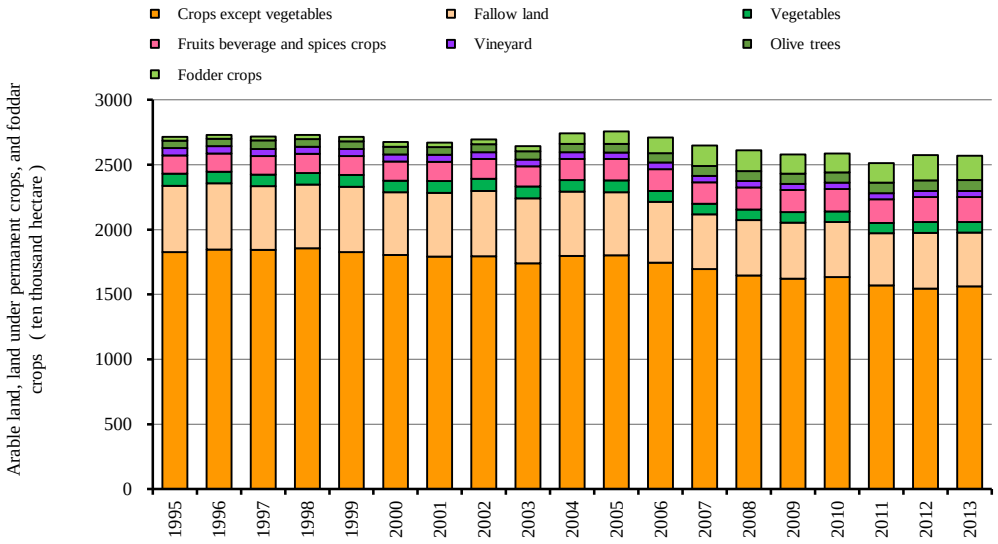


Fig.5 Arable land, land under permanent crops, and fodder crops, 1995-2013

Source: Ministry of Food, Agriculture and Livestock and General Agricultural Censuses in Turkey

3.1 Cereals

3.1.1 Overview

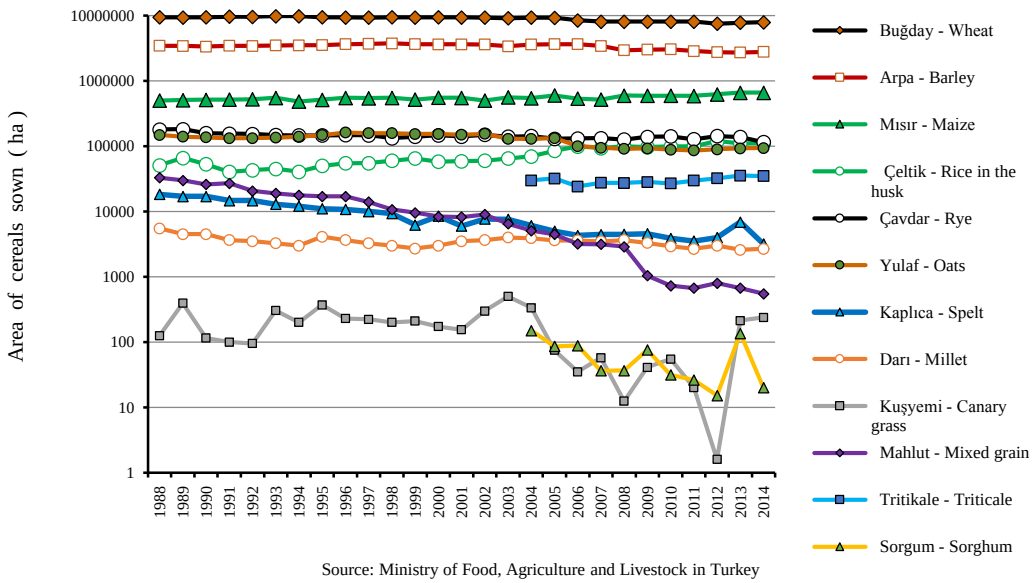
In 2014, wheat occupied 67.5 % in the planted area of main cereals in Turkey, barley 23.8%, corn 5.6%, rye 1% and rice 0.95% (**Table 3**). There are very a few areas of other cereals. Hence, the study showed the annual change of the cereals area using a figure of the logarithmic scale. There were considerably few temporal changes of the area of cereals, however, the planted area of wheat, barley, rye, and oat has decreased little by little (**Fig. 6**). The planted area of rice was approximately doubled in the 21st century. The planted area of spelt wheat, millet and mixed grain has been considerably decreased.

In the amount of production of main cereals of 2014 in Turkey, wheat occupies 58.1%, barley 19.3%, corn 18.2%, rice 2.5%, and rye 0.9% (**Table 3**). Annual change of cereals production is generally small. The production of almost cereals has recently decreased, however, the production of maize, rice, and rye has increased (**Fig.7**).

Table 3 Statistics on main cereals of Turkey in 2014

Tahıllar, - Cereals	Area sown (ha)	Area sown (%)	Production (ton)	Production (%)
Buğday - Wheat	7,919,208	67.5	19,000,000	58.1
Arpa - Barley	2,787,297	23.8	6,300,000	19.3
Mısır - Maize	658,645	5.6	5,950,000	18.2
Çeltik - Rice in the husk	110,884	1.0	300,000	0.9
Çavdar - Rye	115,080	0.95	830,000	2.5
Yulaf - Oats	93,862	0.8	210,000	0.6
Kaplıca - Spelt	3,177	0.3	110,000	0.3
Darı - Millet	2,667	0.03	6,152	0.02
Kuşyemi - Canary grass	239	0.02	6,744	0.02
Mahlut - Mixed grain	552	0.01	827	0.0025
Tritikale - Triticale	34,895	0.002	353	0.001
Sorgum - Sorghum	20	0.0002	81	0.0002

Source: Ministry of Food, Agriculture and Livestock in Turkey



Source: Ministry of Food, Agriculture and Livestock in Turkey

Fig.6 Area of cereals sown in Turkey, 1988-2014

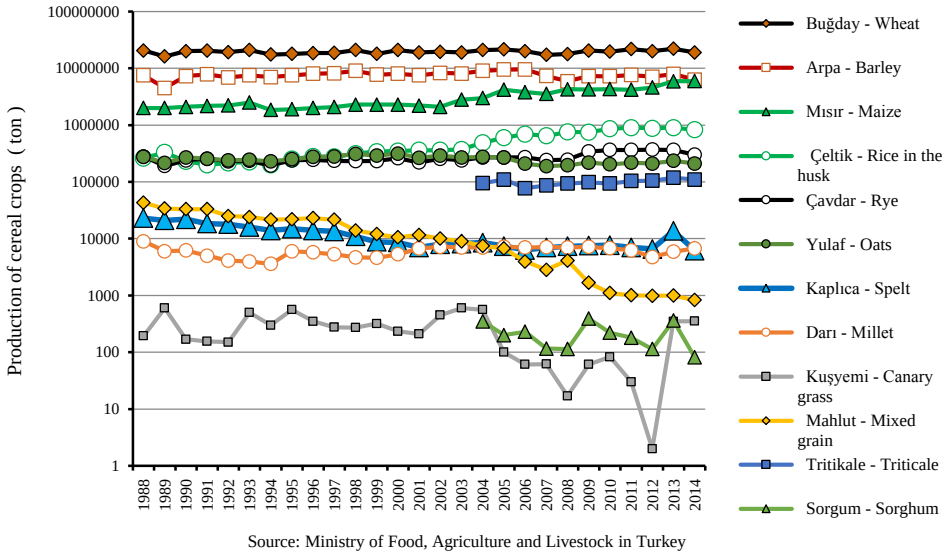


Fig.7 Production of cereal crops in Turkey, 1988-2014

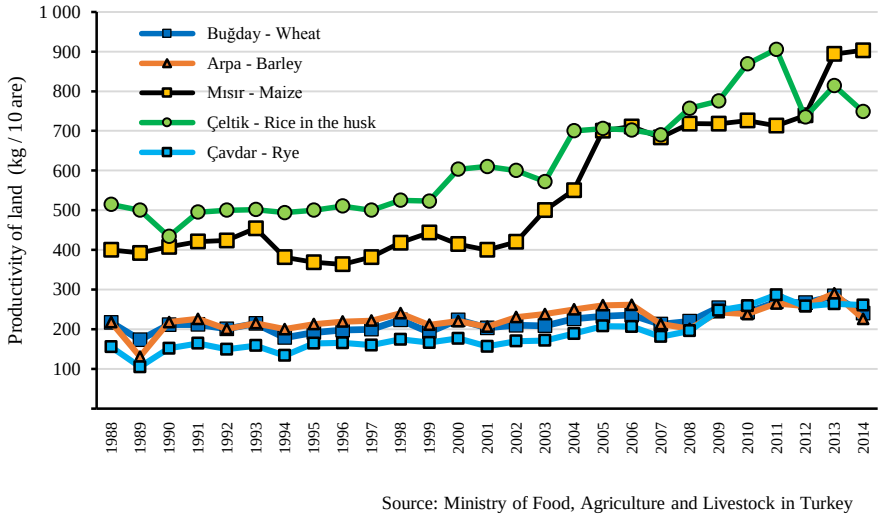


Fig.8 Productivity of land on main cereal crops in Turkey, 1988-2014

Fig.8 depicts the yield of main cereal crops in Turkey. In five cereals, the productivity of rice and maize is high. The productivity of rice in the 1990s was the 500 (kg/10 are) level, but it gradually continued to increase afterwards and came to achieve the 700 (kg/10 are) level or more in the 21st century. The productivity of maize was around 400 (kg/10 are) until the 1990s, but it increased drastically in the 21st century and arrived at the 900 (kg/10 are) level. The productivity of wheat, barley and rye are relatively low, but they have risen little by little.

3.1.2 Wheat

Wheat has long been the basic food in the Turkish diet, generally eaten in the form of bread. Wheat production in Turkey was 2,010 (10^4 metric tons; "metric tons" is abbreviated to "mts." at below.) in 2012 (10^{th} in the world) and the one in Japan was 86 (10^4 mts.). The wheat amount of production was 863 (10^4 mts.) in 1965 and it increased to 2,205 in 2013. The production of the wheat has increased little by little, however, a change of the latter half of the 1970s was remarkable in particular (**Fig.9**). The area harvested of wheat was 803 (10^4 ha) in 1965, it generally increased until the mid-1990s and enlarged to

980 (10^4 ha) in 1994. However, the area harvested decreased afterwards and it recorded 753 (10^4 ha) in 2012. The planting of winter wheat finishes in December. Central Anatolia is the leading grain producing regions of Turkey. Wheat and barley are the traditional products of high plateau region. In Southeast Turkey, the provinces of Sanliurfa, Mardin and Diyarbakir are the primary producers of wheat.

3.1.3 Barley

The production of barley in 1965 was 330 (10^4 mts.), but it began to show remarkable increase after the latter half of the 1970s, and it exceeded 600 (10^4 mts.) in the 1980s. The production of barley still increased to 900 (10^4 mts.) or more in the latter half of the 1990s. However, the production after 2007 does not reach 800 (10^4 mts.) (**Fig.10**). The planted area of barley was 277 (10^4 ha) in 1965 and it was sluggish until the 1970s. But, it continued to increase remarkably after the 1980s and was 375 (10^4 ha) in 1998. The planted area recently decreased and was 272 (10^4 ha) in 2013. One reason for the slow growth in barley production was a change in dietary habits: whereas barley previously had been a staple food, it came to be used almost exclusively as animal feed or for export. In the Harran plateau, where irrigation is just available, farmers are moving away from planting barley in favor of higher returns on other cereals such as milling wheat and corn.

Traditionally, barley has been the preferred feed grain, especially for ruminants. Half of barley consumption as feed went into commercial feed production.

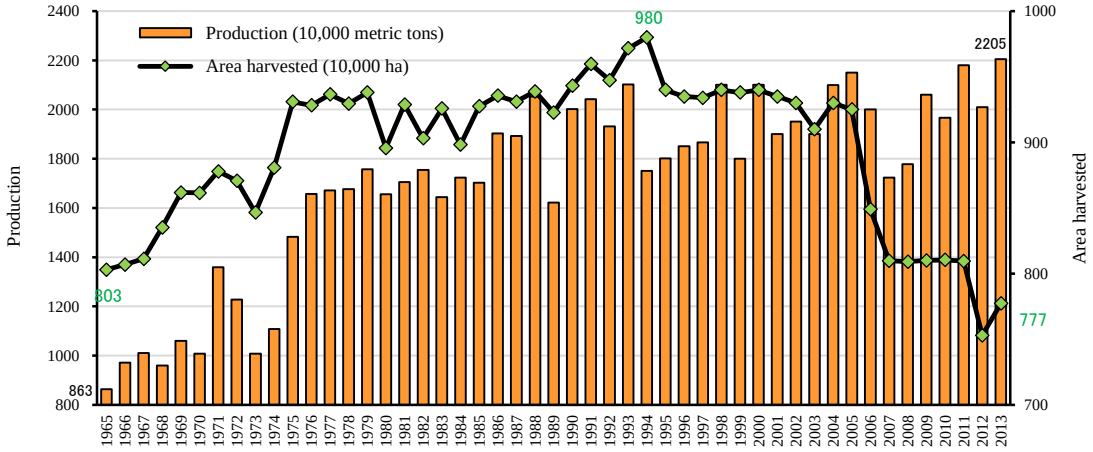


Fig.9 Production and area harvested of wheat in Turkey, 1965-2013

Source: FAOSTAT

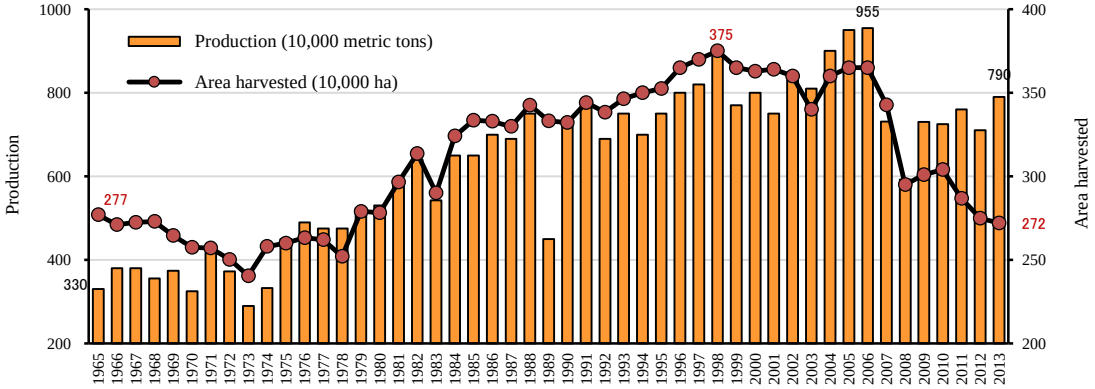


Fig.10 Production and area harvested of barley in Turkey, 1965-2013

Source: FAOSTAT

3.1.4 Maize

The maize production of 95 (10^4 mts.) in 1965 increased little by little until the 1990s and almost doubled. Harvests of corn, which is also used for feed, increased from an average of about 1.1 million tons per year during the 1970s to around 2 million tons per year in the early 1990s.The production was sluggish afterwards until 2002. However, after 2003, the production of maize began to increase rapidly and reached 590 (10^4 mts.) in 2013. It generally increased and the increase in the 21st century in particular is outstanding (**Fig.11**). The area harvested of maize of 650 (10^3 ha) in 1965 decreased in the long term and was 498 (10^3 ha) in 1988. The crop area repeated the increase and decrease afterwards. It recently increased to 660 (10^3 ha) in 2013. Corn is planted from the first week of March until mid-April. The Aegean region, the Çukuroba region, Mediterranean region and South East Anatolia are the primary maize producers in Turkey. Maize is recently becoming more popular among farmers with the increasing availability of irrigation. A street stall of corn appears in lanes in the town in summer. There is a lot of production of the corn in the Black Sea area, and corn and the bread made with corn flour is well-known.

In general, maize fields are very abundant in Turkey. The field given in **Fig. 12** is TR622 (Mersin) region and illustrates the general maize production structure. Maize production needs the plenty of water in growing season and is generally suitable for its cultivation in Turkey where agricultural irrigation is attainable. After the maize oil production increased, its cultivation has developed rapidly in the Mediterranean region. Today, nearly half of the corn production is ob-

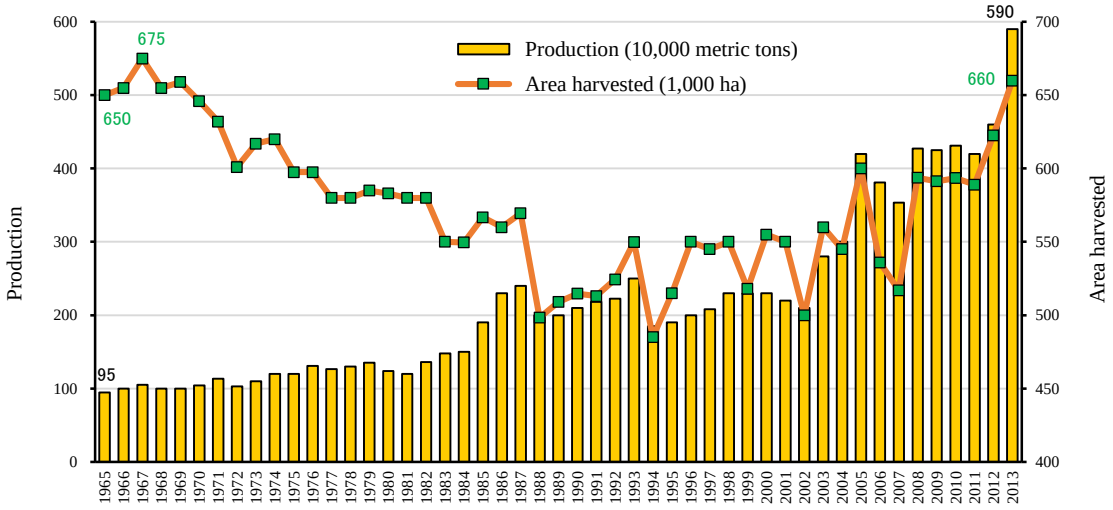


Fig.11 Production and area harvested of maize in Turkey, 1965-2013

Source: FAOSTAT

Fig.12 Maize field in TR622 (Mersin) on August 8, 2015

tained from the Mediterranean region[1]. There have been several irrigation methods for the maize in the region depending on the water conditions like ground water and water canals as in the picture above.

3.1.5 Rice

The production of 217 (10^3 mts.) in 1965 of rice increased until the 1970s and became 375 (10^3 mts.) in 1979. The production continued decreasing afterwards due to a shortage of irrigation water subsequent to the drought period which prevailed between 1985 and 1994 and it became 200 (10^3 mts.) in 1995. The production after the late 1990s of rice continued increasing remarkably and arrived at the 900 (10^3 mts.) level in 2013 (**Fig.13**). The planted area of 50 (10^3 ha) in 1965 of rice repeated the increase and decrease and recorded 77 (10^3 ha) in 1982. The area continued decreasing afterwards until the early 1990s. It enlarged remarkably and it increased after the late 1990s, it spread to 111 (10^3 ha) in 2013 depending on the available irrigation water and market prices.

Fig.14 displays the yield of rice paddy in Turkey and Japan. The land productivity of the rice growing in Turkey had showed the about 400 kg/10a level for a long time, and it had been lower than the one in Japan, but it has begun rapidly to increase since the latter period in the 1990s. It has surpassed the land productivity of Japan after 2004 and maintained the 700 kg/10a level. However, the productivity is average of Turkey and there are in fact, regional differences. During a period of about half a century, the land productivity of rice in Japan rose 200 kg/ 10a. On the

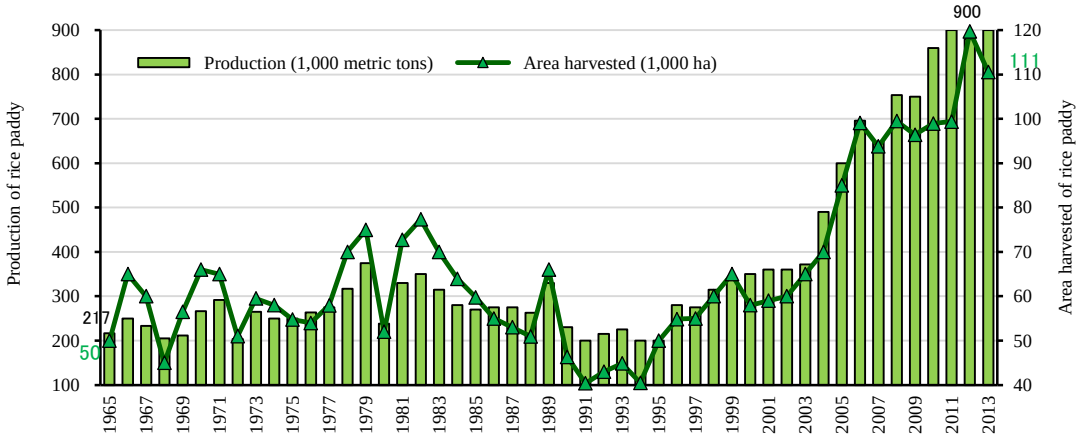
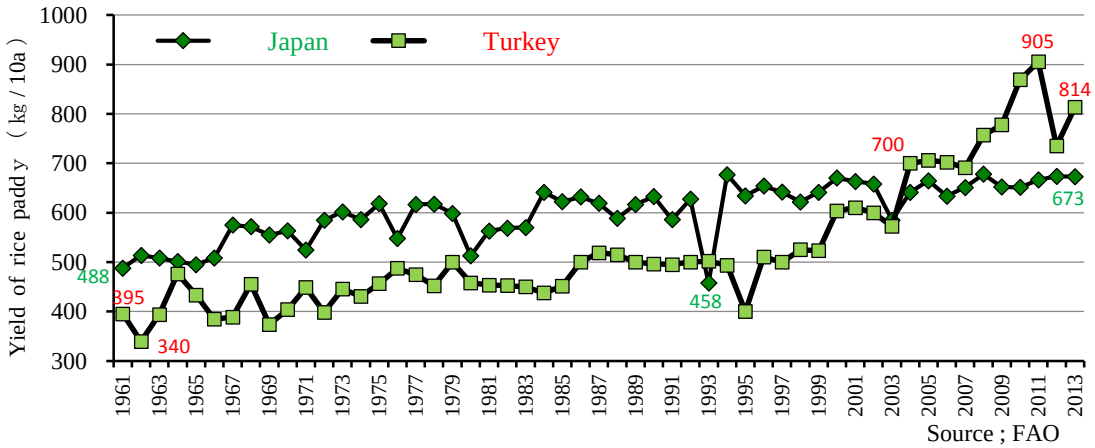


Fig.13 Production and area harvested of rice paddy in Turkey, 1965-2013

Source: FAOSTAT



Source ; FAO

Fig.14 Yield of rice paddy in Turkey and Japan, 1961-2013

other hand, the land productivity of rice in Turkey rose 400 kg/10a and almost doubled.

As Ono, M. (1992) described, direct planting of rice paddy is normally carried out in Turkey, and the rice-transplanting of seedling is not performed. In addition, the management scale of rice growing is bigger than Japan. The average farm size is generally very small in Turkey. Only a few farmers have 100 to 200 ha. area. The most of rice farmers have 2 to 3 ha. area for rice production. Due to this and others, it can be understood that the land productivity of rice growing in Turkey is more than the one of Japan. However, why is it that the land productivity of rice growing in Turkey rose suddenly in the 21st century?

According to Sürek H. (1997), approximately 90% of the production of rice is concentrated in two geographic regions such as Marmara-Thrace and Black Sea mainly owing to the climatic condition like precipitation. The rice is cultivated in other areas, but the quantity does not go too far just a little bit. After the varietal improvement of rice had been initiated in 1970, many varieties have been introduced from Italy (*Baldo*, *Rocca*, *Rybe* and *Venerya*), Bulgaria (*Plovdyna*, *Ranbally* and *Rodyna*), Russia (*Krasnodarsky-424*) and etc. The crossing program of rice started in 1979, seven rice varieties such as *Altinyazi*, *Ergene*, *Meryç*, *Trakya*, *Serhat-92*, *Sürek-95*, and *İpsala*, were developed, and they released for different areas in Turkey.

The *Rocca* variety occupies the largest cultivating area in Turkey, followed by *Baldo*. The *Veneria* variety is grown besides seven varieties above in Marmara-Thrace region. In Black Sea region, the varieties such as *Krasnodarsky-424*, local varieties, *Ribe*, *Rocca*, and *Serhat-92* are grown. A varietal improvement program is conducting in the Diyarbakyr, Edirne and Samsun institutes and it aims to develop high yielding varieties with various desirable traits. Beser N. and Sürek H. (2001) and Sürek H. and Beser N. (2001) went on with rice research strategies under temperate conditions. Heivacioğlu et al. (2015) surveyed the production costs of rice in Edirne province by using some systematic data collection techniques.

According to Gaytancioglu, O. and H. Sürek, H. (2000), varieties of rice cultivated in 1996 by region are shown in **Table 4**. The planting rate of *Baldo* was high in Thrace and South Marmara regions. On the other hand, three varieties of rice were planted at the similar ratio in the Black Sea region. Then, **Table 5** shows the rice production costs for 1 kg of rough rice by region. Land or field rent accounted for the greatest share of production costs, ranging from 24.1 to 38.8% among the regions. In Turkey, only a limited area of land is suitable for rice cultivation and many farmers are eager to produce rice, which results in increased demand for rice fields and expensive land rents. The expense for fertilizer, chemicals, harvesting is comparatively large. The yield in Thrace, South Marmara and Black Sea regions is however, fairly high level comparing with the one in Japan. On the other hand, the yield in Southeastern Anatolia region remains a considerably low level. Rice production costs were the lowest in South Marmara (US$0.30/kg) with Thrace and the Black Sea regions following at $0.33/kg. Southeastern Anatolia had the highest production costs because of a low grain yield per hectare.

Rice production cost varies depending on farm size and is higher on small farms than on larger farms. This is a common-sense fact, but was demonstrated by data of the rice growing of Turkey (**Table 6**). However, the difference of the production cost between large-scale management and the small management is not outstanding in this case so much.

Table 4 Varieties of rice cultivated in 1996 by region (%)

Region	Thrace	South Marmara	Black Sea	Southeastern Anatolia	Overall
Baldo	62.4	89	4	-	38.5
Krasnodarsky	-	-	27.7	-	10
Ribe	-	-	28.4	-	9.2
Rocca	37.6	11	24.7	-	32.3
Serhat-92	-	-	10.2	-	4.6
Veneria	-	-	-	-	2.3
Other	-	-	5	100	3.1
Total	100	100	100	100	100

After Gaytancioglu, O. and H. Sürek, H. (2000)

Table 5 Rice production costs for 1 kg of rough rice in 1996 by region (US$/ha)

Expense	Region							
	Thrace	%	South Marmara	%	Black Sea	%	Southeastern Anatolia	%
Field rent	700	31.9	500	24.5	500	24.1	500	38.8
Licence (hygienic precautions)	2.8	0.1	3	0.1	1.5	0.07	2.5	0.2
Fertilizer	150	6.9	135	6.6	110	5.3	41.3	3.2
Fertilizer application labor	15	0.7	7.5	0.4	20	0.9	5	0.4
Seed	120	5.5	80	3.9	90	4.3	48	3.7
Water	75	3.4	75	3.7	80	3.9	50	3.9
Irrigation labor	25	1.1	35	1.7	50	2.4	50	3.9
Chemicals	200	9.1	200	9.8	150	7.2	-	-
Agricultural chemicals labor	20	0.9	30	1.5	40	1.9	-	-
Ploughing	80	3.7	100	4.9	75	3.7	-	-
Preparation of levees	70	3.2	100	4.9	75	3.7	-	-
Preparation of canals	50	2.3	50	2.4	50	2.4	-	-
Sowing	10	0.5	20	0.9	10	0.5	5	0.4
Harvesting	100	4.6	100	4.9	150	7.4	120	9.3
Drying	20	0.9	50	2.4	60	2.9	30	2.3
Bagging	20	0.9	50	2.4	20	0.9	20	1.6
Transfer to threshing area	15	0.7	25	1.2	40	1.8	40	3.1
Transfer to store	10	0.5	25	1.2	50	2.4	30	2.3
Transfer to market	10	0.5	6.5	0.3	17.5	0.8	30	2.3
Guard fees	5	0.2	5	0.2	15	0.7	15	1.2
Bag and rope expenses	32	1.4	15	0.7	30	1.4	10	0.8
Other	5	2.3	50	2.3	50	2.4	50	3.9
Total	1,779.8	-	1,662.0	-	1,688.2	-	1,046.8	-
Yield (kg/ha)	6,610		6,720		6,310		3,250	

After Gaytancioglu, O. and H. Sürek, H. (2000)

Table 6 Production costs by farm size (US$/kg)

Farm size (ha)	Number of farms	Lowest cost	Highest cost	Average cost	95% confidence limit	
					Low limit	High limit
0 - 1.0	18	0.39	0.42	0.39	0.39	0.4
1.0 - 2.5	27	0.37	0.41	0.38	0.38	0.39
2.5 - 5.0	18	0.34	0.38	0.36	0.35	0.36
5.0 - 10.0	22	0.32	0.38	0.35	0.34	0.36
More than 10.0	13	0.27	0.36	0.33	0.31	0.34
Overall	98	0.27	0.42	0.37	0.36	0.37

After Gaytancioglu, O. and H. Sürek, H. (2000)

Fig.15 Rice field in TR212 (central Edirne)

Note: photographed by the author on September 12, 2015

Before these studies, Torun M. (1996) also conducted similar research. How to cook rice which doesn't put oil in is called lapa and is said to be "the pilaf which isn't nice". Principal food in Turkey is bread to the end, so pilaf is only a garnish dish.

There can be a necessity to focus on paddy fields in Thrace region, especially in Edirne because Edirne with its districts (especially İpsala district) produces about 50% of the total rice production of Turkey itself and 90% of total production in Thrace region. **Fig. 15** shows the paddy field in Edirne which is close to city center. It is another important dimension that many farmers in Edirne deal with different works and are employed in private and public sectors because they do not need to spare long time for the fields which are very close to city center and very fertile. The cultivation of paddy fields begins in mid of May when the weather temperature is between 18-35 ^{o}C and the water temperature is at least 12 ^{o}C. With minor differences according to the areas, the harvesting begins in the mid-Sept. and ends in the end of October. The irrigation for the paddy fields is usually based on water canals with the advantage of the Maritsa.

The agricultural lands are based on private ownership in Turkey and the agricultural structure is dominated by small family businesses. Thrace region is one of the important regions of Turkey in terms of agricultural production and productivity. Edirne is an important city in the region by varieties of agricultural products which are rice, wheat, sugar beet, and sunflower. Recently, there has also been an increase in the fruit production such as grapes, apples, watermelon, melon, pears, and plums.

3.2 Vegetables (Sebzeler)

3.2.1 Overview

Table 7 presents area harvested and production of Turkish main vegetables in 2013. Legumes are excluded. Here, we choose some vegetables in which the harvested area and production is comparatively large. Harvested area of watermelon is particularly vast and strawberries and melons are also widely cultivated. In the leafy vegetables, lettuce is the most widely cultivated. In the production, sugar beet and tomatoes are particularly large. In the production of other crops, potatoes, green peppers, onion, and cucumber is noticeable.

3.2.2 Tomatoes (Domates)

Because tomatoes are used for various dishes, they are produced a lot in Turkey. The production of tomatoes in Turkey is 1,135 (10^4 mts.) in 2012 and is the fourth place in the world next to China, India, and the United States. There is the tomatoes production of 72 (10^4 mts.) in 2012 in Japan. The production of tomatoes which was 128 (10^4 mts.) in 1965 continued to increase smoothly in Turkey and it increased to 1,182 (10^4 mts.) in 2013 which is approximately 9 times of original amount of production (**Fig.16**). The planted area of tomatoes which was 57 (10^3 ha) in 1965 had continued to increase smoothly. They increased to 311 (10^3 ha) of approximately 5 times of 1965 in 2013.

Table 7 Area harvested and production of main Turkish vegetables in 2013

Main vegetables	Area harvested (ha)	Production (ton)
Watermelons	11,533,210	3,887,324
Strawberries	2,087,227	372,498
Melons, other (inc.cantaloupes)	1,261,397	1,699,550
Lettuce and chicory	311,000	436,785
Sugar beet	291,000	16,483,000
Tomatoes incl. fresh, juice, paste and peeled	213,927	12,215,993
Potatoes	125,030	3,948,000
Chillies and peppers, green	73,697	2,159,348
Pumpkins, squash and gourds	63,796	388,785
Carrots and turnips	54,759	569,855
Leeks, other alliaceous vegetables	25,901	240,391
Onions dry, shallots, green	21,352	2,058,324
Cauliflowers and broccoli	21,230	158,996
Eggplants (aubergines)	9,527	826,941
Cucumbers and gherkins	9,420	1,754,613
Spinach	7,745	220,274
Cabbages and other brassicas	2	720,257

Source; FAO

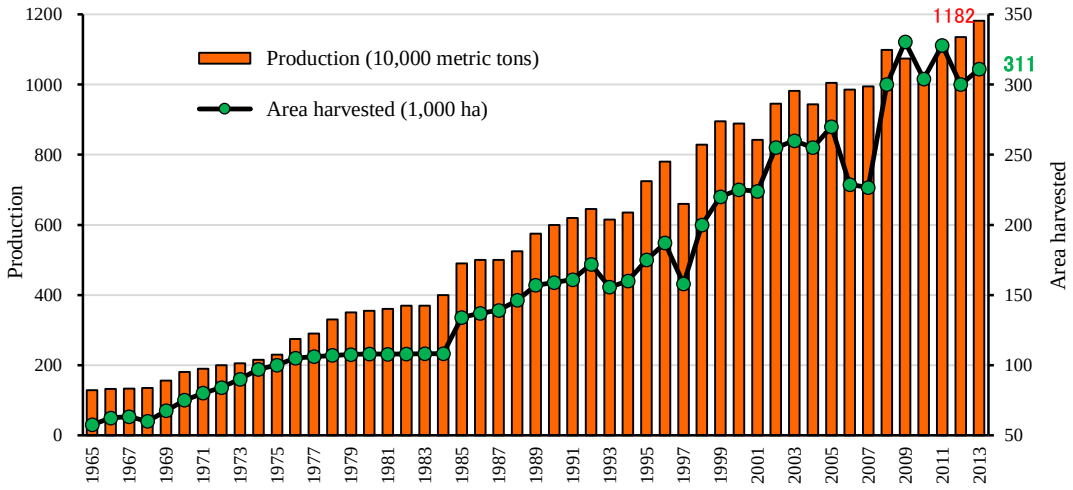


Fig.16 Production and area harvested of tomatoes in Turkey, 1965-2013

Source: FAOSTAT

Tomatoes account for about 40 percent of vegetable production and about 50 percent of the export of vegetables in Turkey. The number of varieties of the table tomatoes is about 400. Tomato cultivation is a labor intensive and planting and harvesting requires mostly handwork without agricultural machines. About 30 percent of tomatoes is used for processing (3,430,000 tons in 2011). The most part of commercial production is small-scale management by the family and it is conducted in an open field. There is a lot of leased land management. An average of the tomato cultivation area is about 0.7 hectares.

According to Keskin G. (2010), approximately 90% of the tomatoes processed in the industry are used in tomato paste production. More than 3/4 of the tomatoes are produced in the provinces of Balikesir, Bursa, Izmir and Konya, whereas more than 1/2 of the table tomatoes are produced in the provinces of Antalya, Çanakkale, Mersin, Mulga and Tokat. Of the tomato production, 20% is carried out under greenhouse

condition in Turkey and such production is particularly widespread in the provinces of Antalya in Mersin in the Mediterranean region. Production under greenhouse condition is carried out in plastic greenhouses, glass green houses, and in low and high tunnels. Because plastic greenhouses are cheaper and functional, it is continuously increasing. The tomatoes produced in open field are used in table consumption.
Tomatoes are playing the leading role who is not conspicuous for Turkish food. Tomato appears on breakfast and salad certainly and most of stew is the tomato taste.

After 2008, the largest company, TAT of tomato processing borrowed about 10,000 hectares of farmland around Şanlıurfa in a southeastern Anatolia area, began planting and harvesting of tomatoes using a drip irrigation system and a large machines and also constructed tomato fabrication plant. The tomato processing companies such as Tukas, Tamek, Merko, Assan, Tuncsan and Deneks covenant with 200 or 500 farmhouses from October to November every year for production and processing of tomatoes. Tomato farmers receive plants, chemical fertilizer and an advance from processors and ships tomatoes to them. Processors decide the variety of tomatoes in January and February, and companies of seed and sapling produce plants in March and April and distributes them to farmers. A harvest time is from July to September. The number of variety of tomatoes for processing is about 60, and more than half is the hybrid kind. It increases in prescription of a fertilizer and soil improvement material to control ph in ground.

3.2.3 Watermelons (Karpuz)

Turkey is the second largest watermelon producing country after China. The production of watermelons in Turkey was 4,044,184 ton and accounts for about 20 percent of the world production in 2012. The production was 198 (10^4 mts.) in 1965, but it continued to increase afterwards and reach 458 (10^4 mts.) in 2002. The production of watermelons does not have a big change in the 21st century. It showed 389 (10^4 mts.) in 2013 (**Fig.17**). The planted area of watermelons repeated the increase and decrease in the long term. The area of 120 (10^3 ha) in 1965 increased and showed 154 (10^3 ha) in 1980. It decreased afterwards and fell to 103 (10^3 ha) in 1990. After the 1990s, the planted area includes the increase and decrease, but it is in a tendency to increase in the long term, it increased to 158 (10^3 ha) in 2013. The main growing regions of watermelon are Aegean, Mediterranean, Southeastern Anatolia and Marmara region. In a provincial basis Adana alone provides about 20% of watermelon production of Turkey. F1 hybrid seeds are used in all the covered plantation areas. A watermelon often grows up in the hot area, and Diyarbakır in southeast Turkey is renowned as a watermelon production district. The production of a watermelon is also popular in Bursa area and Tekirdağ of Trakya area.

3.2.4 Sugar beets

Turkey is the largest sugar beets producer in the Middle East and the fifth largest sugar beets producer. The production of sugar beets was 342 (10^4 mts.) in 1965, it generally continued to increase, and recorded 2,228 (10^4 mts.) in 1998. It would increase to 6.5 times. It shows a tendency toward decrease or stagnation afterwards and showed 1,648 (10^4 mts.) in 2013 (**Fig.18**). The planted area of sugar beets had a tendency to stagnation from the 1960s through the early 1970s. It continued to increase after the 1970s and became 504 (10^3 ha) in 1998. It increased to approximately 3 times of 1965. However, it continued to decrease afterwards and showed 291 (10^3 ha) in 2013. There are 33 sugar beets refineries and six starch-based sweetener producers in Turkey. The state-

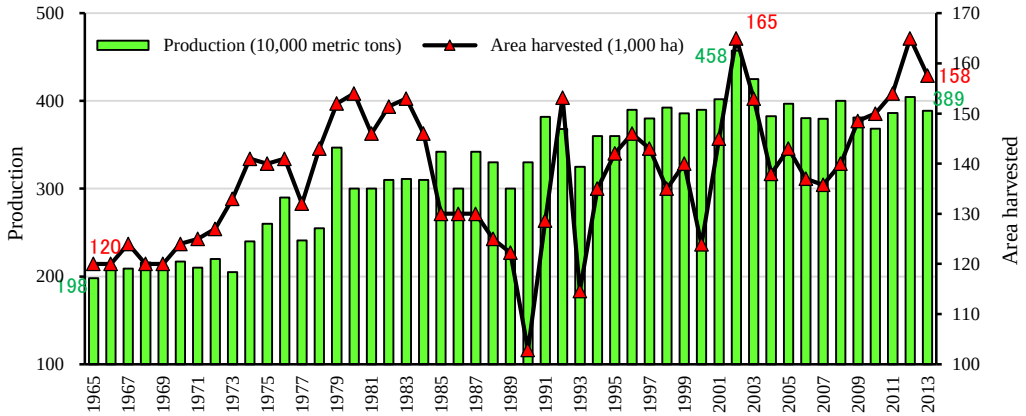


Fig.17 Production and area harvested of watermelons in Turkey, 1965-2013

Source: FAOSTAT

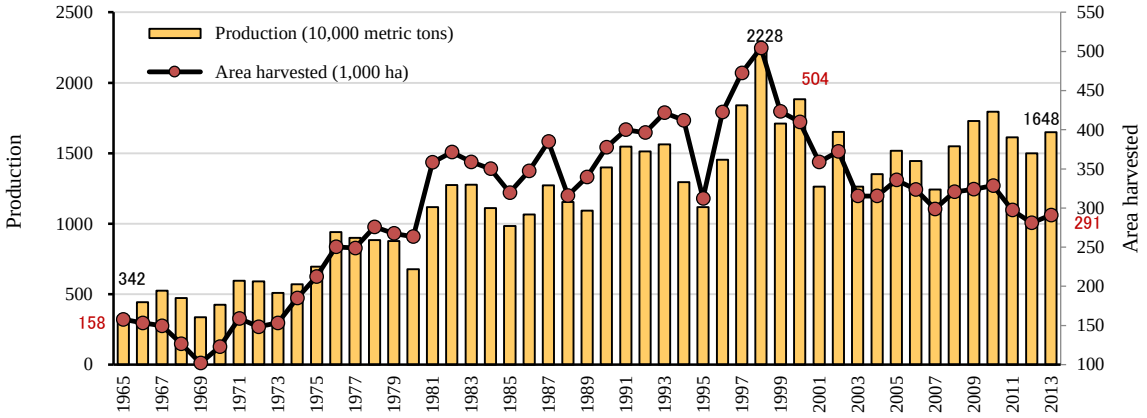


Fig.18 Production and area harvested of sugar beets in Turkey, 1965-2013

Source: FAOSTAT

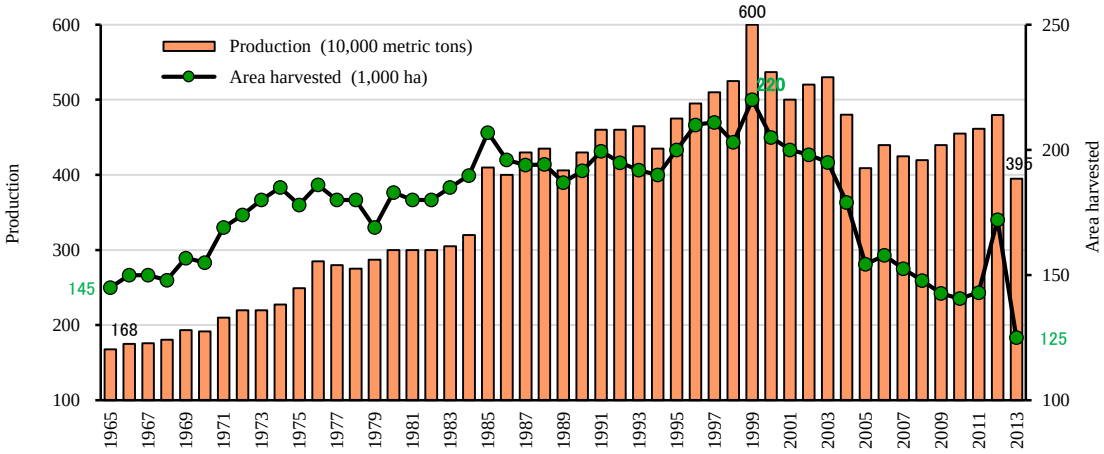


Fig.19 Production and area harvested of potatoes in Turkey, 1965-2013

Source: FAOSTAT

owned sector owns 25 of the sugar refineries, while the remaining eight are privately owned. Sugar beets is cultivated mainly in the Central Anatolian region, with the leading producing provinces, Konya, Eskisehir and Afyon. Sugar beets is generally grown in a three- or four-year rotation with cereals, pulses, sunflower, and fodder crops. Planting begins in February and continues through May, with the harvest from late July to November.

3.2.5 Potatoes (Patates)

According to Çalışkan M. E. et al. (2010), potato production in Turkey has increased in a slow pace until the 1930s, but it has rapidly increased thereafter. Especially the first National Potato Project in the 1970s and the subsidization of the private seed potato production sector in the 1980s have contributed remarkably to the potato production, Up to 1999, both the area cropped to potato and the quantities produced showed a steady increase, and Turkey reached 220,000 ha of planting area and 6 million ton of production (**Fig.19**). The ratio of the subsidy for the gross income of potatoes in farm households was the 60% level in 2011 (OECD, PSE/CSE Database).

Turkey has very favorable geographical conditions for potato production. Therefore, potato is grown in nearly all provinces (75 of 81) and during the whole year in Turkey. Despite the production of potato in the entire country, the vast majority of potatoes are grown in the Middle Anatolia region. The production of potatoes in 1965 was 168 (10^4 mts.), it gradually increased and showed 600 (10^4 mts.) in 1999. However,

it decreased in the 21st century and showed 395 (10^4 mts.) in 2013. The production of potatoes in 2012 in Turkey was 4,822,000 tons with the world 13th place. The production of potatoes in Japan was 2,500,000 tons in the same year. The planted area of potatoes was 145 (10^3 ha) in 1965, it gradually increased to 220 (10^3 ha) in 1999. However, when it was the 21st century, the production decreased to 125 (10^3 ha) in 2013. The huge baked potato called Kumpir is being the standard of a stand-up meal at a street corner.

3.2.6 Strawberry (Çilek)

The planted area and the harvests of the strawberry (*Fragaria Xananassa*, Turkish: çilek) increased smoothly. During the last five years important developments have occurred in strawberry culture in Turkey. Total strawberry production reached approximately 372 thousand tons in 2013. According to Kaska N. (1997), there are numerous suitable places for production but the Mediterranean coastal areas have the greatest potential with their citrus climate and sandy soils. In this area, modernized various methods such as summer and autumn plantings, solarization, fresh runners rooted in pots (FRRP), drip irrigation, black plastic mulching, fertigation, walk-in high tunnels, plastic and glass houses are currently being used. Therefore, the harvesting of fresh strawberries starts in the second half of November and continues up to July. Californian cultivars are mainly grown. After the introduction of greenhouse farming, the quality of the strawberry in Turkey has been improved remarkably. It is also said that six varieties of strawberries are grown in Turkey. These are the large fruited frenk çileği ("Frankish strawberry"), the very fragrant Arnavutköy variety (Osmanli or Ottoman strawberry), the sera çileği (greenhouse strawberry), the Ereğli strawberry, the Bursa strawberry and the wild strawberries. **Fig. 20** shows the trend in strawberry production and area harvested. The trend for both is totally increasing during the years.

The most important producers of strawberry are TR622 Mersin (36.3% of total), TR611 Antalya (21.2%) and TR321 Aydin (13.1%). Strawberry production is 125 thousand tons in Mersin; 63 thousand tons in Silifke district (50.4%) and 59.5 thousand tons of (47.6%) in Anamur district exporting to Russia, Romania, Poland, Ukraine, Bulgaria, Croatia, Hungary, Serbia, Germany and Latvia[2]. **Figs. 21** and **22** show a strawberry field example in TR622. Pictures are taken in very close places in Silifke district. Even though places are very close, there have been different irrigation systems, drip system in **Fig. 21** and canal system in **Fig. 22**. The use of different systems is usually resulting from the cost and availability of the system.

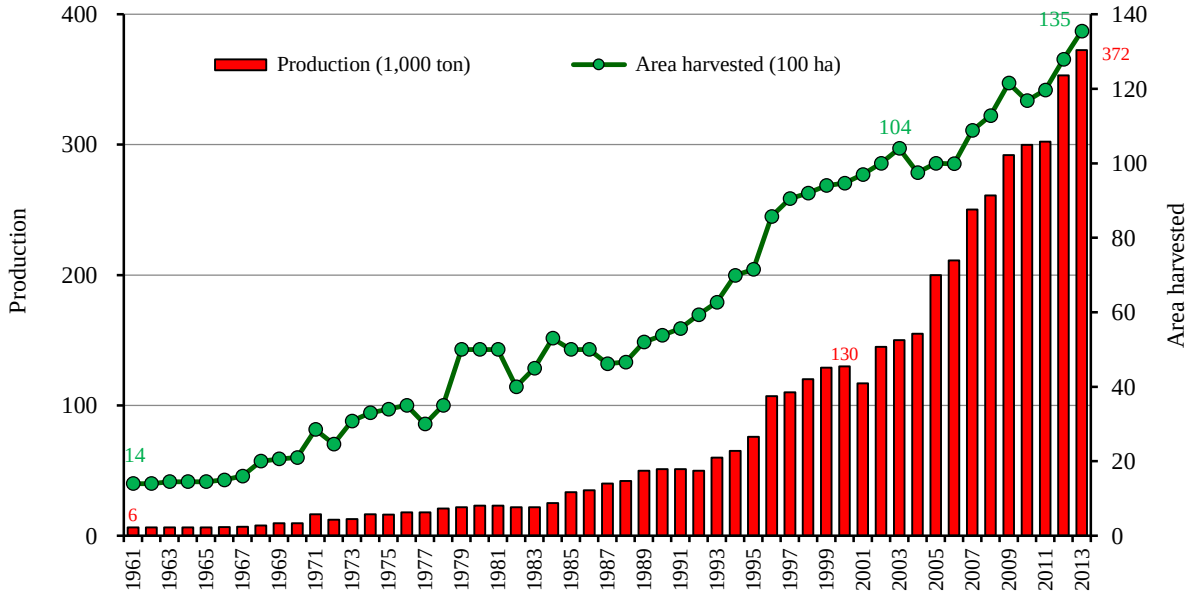


Fig.20 Production and area harvested of strawberry in Turkey, 1961-2013

Source: FAOSTAT

Fig.21 Strawberry field in TR622 irrigated by drip system on August 8, 2015

Fig.22 Strawberry field in TR622 irrigated by canals on August 8, 2015

3.3 Fruits (Meyveler)

3.3.1 Overview

Area harvested and production of main fruits in Turkey for 2013 is given in **Table 8.** According to the table, harvested area of peaches and nectarines is the highest with 11,533,210 ha; however, grape is the highest in production. **Fig.23** shows the transition of production for main fruits and the other crops in the 21st century. The totals of production of these crops have increased little by little. The production of grapes and oranges has also increased little by little. Because there are a good harvest and off year to apples and olives, the increase and decrease of the production is not outstanding. The hazelnut is a Turkish special product, but the amount of production decreases. The production of tea leaf increases gradually.

In the previous study, Kishimoto, O. (1977) explained the production and its distribution of 11 kinds of Turkish fruit trees in the 1950s and 1960s by using maps and examined the relations with the weather factors in terms of a multiple regression analysis. As a result, it became clear that the areas which annual mean air temperature is high for oranges and figs, which dries from July to September for grapes and where there was much precipitation from October to March for olives, were desirable as a growth condition.

.

Table 8 Area harvested and production of main fruits in Turkey in 2013

Fruits	Area harvested (ha)	Production (ton)
Peaches and nectarines	11,533,210	637,543
Grapes, incl. raisins, juice and marc	6,043,247	4,399,509
Cranberries	1,117,618	76
Apples incl. juice	907,682	3,268,228
Plums dried (prunes)	891,601	4,581
Fruit, stone nes	651,426	16,504
Oranges incl. juice	634,454	1,782,958
Berries nes	450,910	74,600
Cherries incl. sour	136,253	674,077
Plums and sloes	125,585	305,393
Tangerines, mandarins, clementines, satsuma	100,578	942,226
Pears	76,426	461,826
Apricots, fresh and dry	60,873	973,502
Lemons and limes incl. juice	49,591	727,446
Grapefruit (incl. pomelos) and its juice	41,500	228,799
Bananas	13,549	215,472
Figs incl. fried		346,914
Quinces	6,500	139,311

Source; FAO

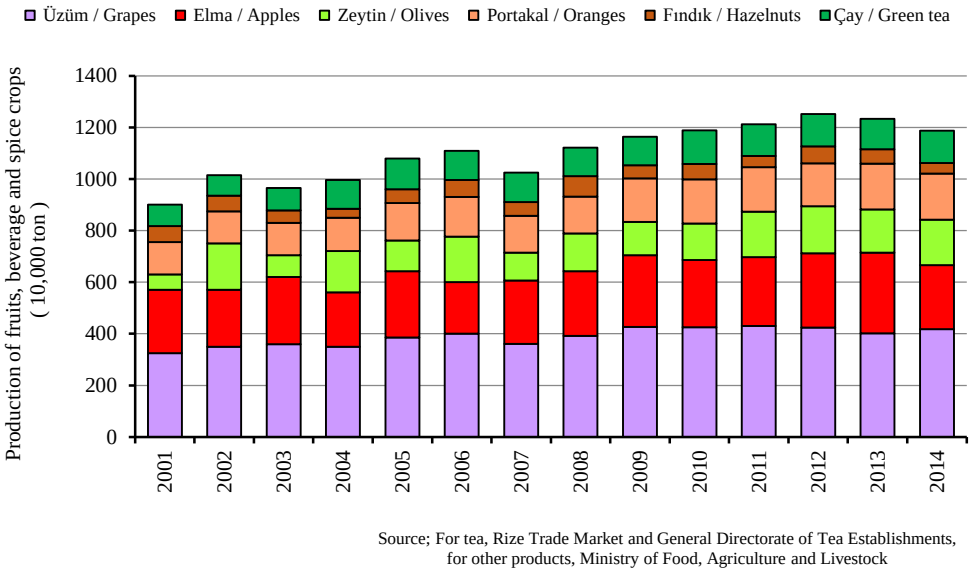


Fig.23 Production of main fruits and the other crops in the 21st century

3.3.2 Grapes (Üzüm)

The production of grapes of 2012 in Turkey is 4,275,659 tons with the world sixth place. The production of grapes in Japan is 198,300 tons in the same year. The production of grapes was 335 (104 mts.) in 1965, it changed while repeating the increase

and decrease and increased to 401 (104 mts.) in 2013 (**Fig.24**). The planted area of grapes maintained 800 (10^3 ha) until the 1970s. However, it continued to decrease afterwards and it showed 469 (10^3 ha) in 2013. The ratio of the subsidy for the gross income of grapes in farm households was the 50% level in 2011 (OECD, PSE/CSE Database).

Turkey is known to have between about 1,200 and 1,500 named grape varietals growing across all of its regions of which around 30 of them produce outstanding wines. The well-known varieties of grapes are listed below (**Table 9**).

Also, **Fig.24** shows the production and area harvested of grapes in Turkey between 1965 and 2013. It is obvious that grape harvesting area is decreasing while production (10,000 tons) is increasing. On the other hand, Aegean Region, especially TR310 (İzmir), is very important for the grape production as seen in **Fig.25**.

Table 9 Indigenous varietals of grapes in 2013 of Turkey

Variety	Production (ton)	Region	Property
Emir	5,500	Mid- Southern Anatolia	the native grape of Cappadocia.
Narince	6,150	the Mid-Eastern Anatolia, Tokat	means “delicately”
Sultaniye	14,000	the Aegean, mainly in Denizli and Manisa.	mostly consumed as table grapes and raisins
Bornova Misketi	910	the Aegean, İzmir.	the Muscat of Turkey
Kalecik Karası	6,885	the Aegean, Mid-Northern and Mid-Southern Anatolia	Red grape
Öküzgözü	11,830	Mid-Eastern Anatolia and the Aegean	Red grape
Boğazkere	8,850	South East Anatolia	means “throat burner”
Çalkarası	5,000	the Aegean, Denizli	Rosé wines

Source; Turkey’s Primary Indigenous Grape Production by Region

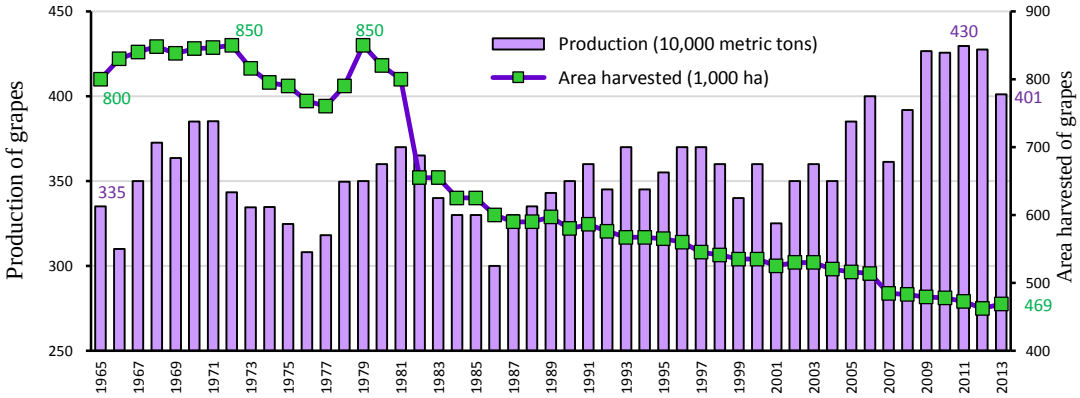


Fig.24 Production and area harvested of grapes in Turkey, 1965-2013

Source: FAOSTAT

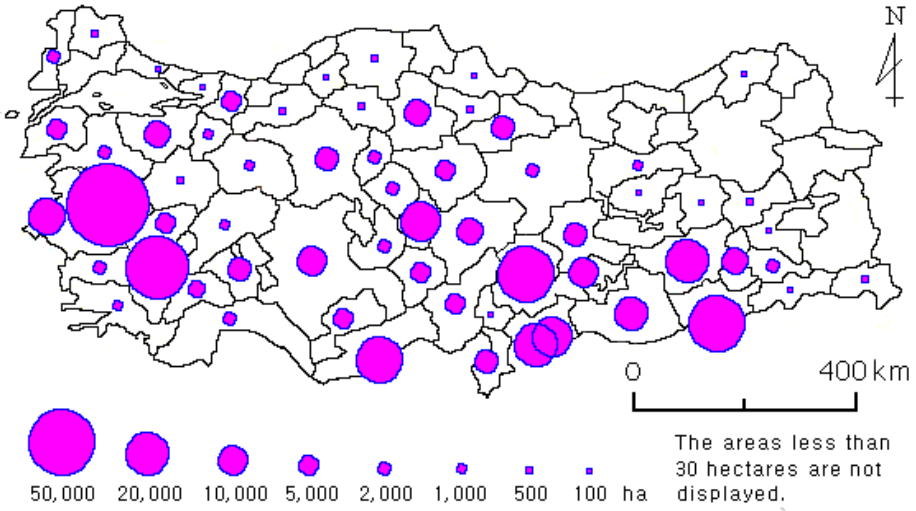
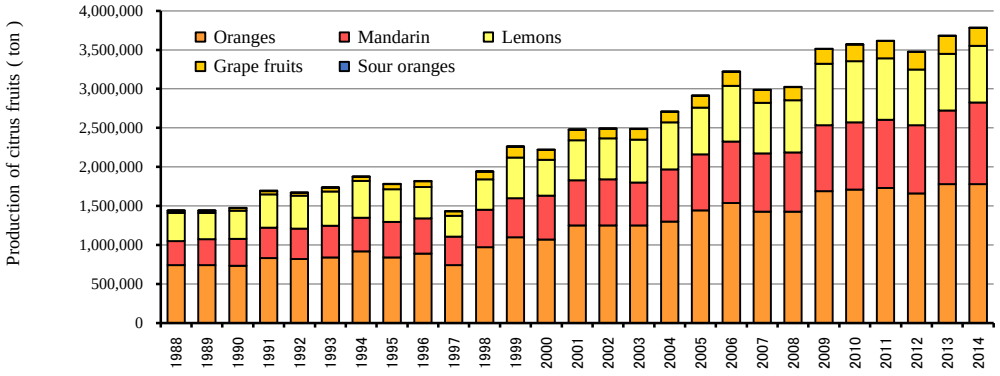


Fig.25 Vineyard area in Turkey in 2013

Source: Regional Statistics in Turkish Statistical Institute



Source; Ministry of Food, Agriculture and Livestock in Turkey

Fig.26 Production of citrus fruits in Turkey, 1988-2014

A color of *Narince* is sage green and the shape is a big ellipse. *Narince* is used for table, wine and raisin. In addition, the main varieties of the grape cultivated in Turkey seem to be as follows; *Aküzüm* (The color is red, the form are spherical, and the use is for a dining table(raw diet)), *Çavuş* (from yellow to green, from vesical to a sphere and for a dining table), *Çekirdeksiz* (light yellow, from vesical to sphere and for a dining table and raisin), *Delikara* (blackish red, large round shape, and for wine), *Horozkarası* (dark purple, big shape and for a dining table), *Kadınparmağı* (from yellow to green, a big ellipse and for a dining table and raisin), *Kozak* (big sphere tinged with the green and for a dining table), *Müşküle* (from white to amber, vesical and for a dining table), and *Razakı* (fairy, big ellipse, and for a dining table, raisin).

3.3.3 Oranges (Portakal), lemons and limes

The amount of production of citrus fruits largely increased. The growth rate of production of five kinds of citrus fruits is 262% during the period from 1988 to 2014 (**Fig. 26**). In the production of citrus fruits in 2014, oranges occupy 46%, mandarin approximately 28%, and lemons 19%, respectively. As for the rate of temporal change of production, oranges have experienced 240%, mandarin 338%, and lemons 201%, respectively.

The production of oranges in 1965 was 30 (10^4 mts.) in Turkey, it continued to increase smoothly in the long term and showed 178 (10^4 mts.) in 2013. The production of oranges increased to approximately 6 times in some 50 years (**Fig.27**). The planted area of oranges was 25 (10^3 ha) in 1965, it continued to increase little by little and enlarged to 55 (10^3 ha) in 2013.

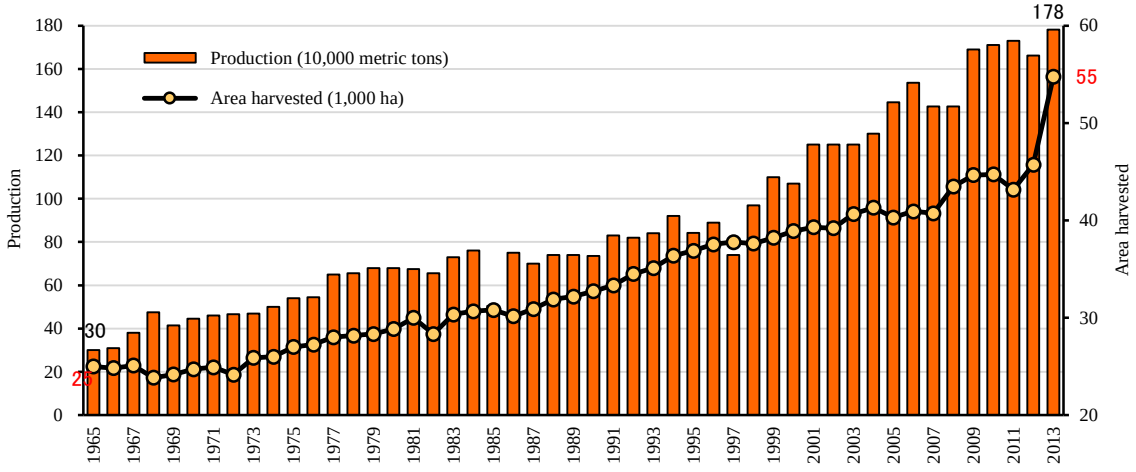


Fig.27 Production and area harvested of oranges in Turkey, 1965-2013

Source: FAOSTAT

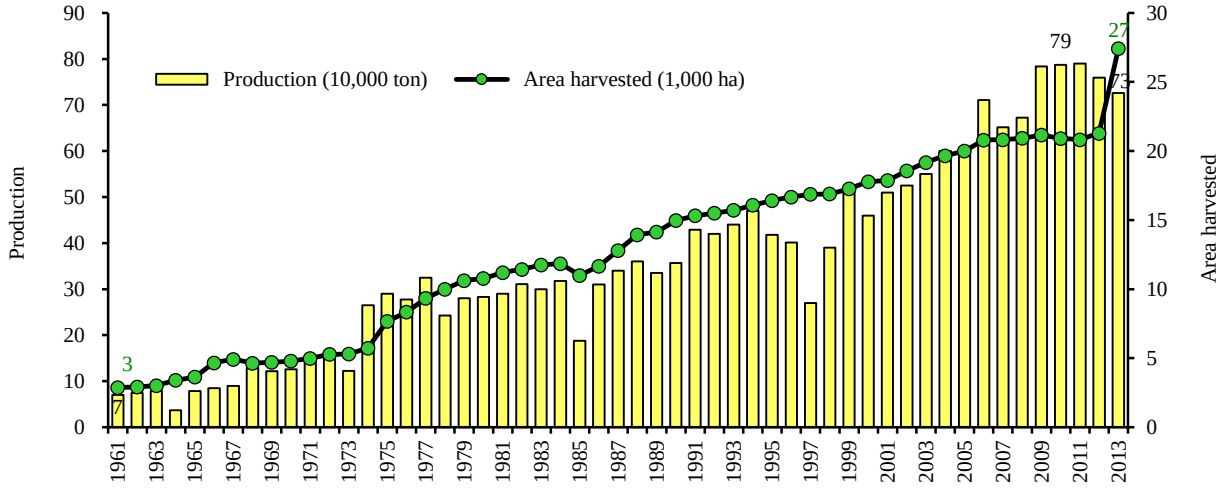


Fig.28 Production and area harvested of lemons and limes in Turkey, 1961-2013

Source: FAOSTAT

The amount of production and area harvested of lemons and limes increased smoothly to approximately 10 times in about half a century (**Fig. 28**). Aegean and Mediterranean coasts provide 95% of citrus production in Turkey and it can be divided into three main sections. Each of these sections has specialized in terms of cultivation of different varieties of citrus. About 72% of citrus is produced in Çukurova region in 2013, 96% of total grapefruit production, of the 86% of total lemon production, 62% of total orange production, and 75% of total mandarin production. The leader cities in production of citrus (in tons) is Antalya is in the first place of orange production; Hatay is in mandarin production, Mersin is in lemon production, and Adana is in grapefruit production[3]. **Fig. 29** shows a lemon field, which is also very close to sea cost (Silifke district).

Fig.29 Lemon field in TR622 irrigated by canal on August 8, 2015

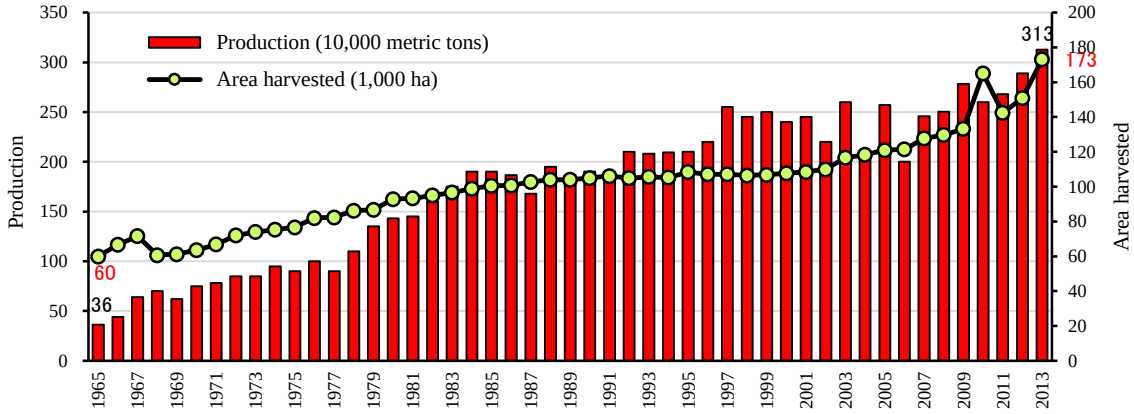


Fig.30 Production and area harvested of apples in Turkey, 1965-2013

Source: FAOSTAT

3.3.4 Apples

The production of apples of 2012 in Turkey was 3,128,450 tons and it was next to China and the United States with the third place in the world. The production of apples in Japan is 741,700 tons in the same year. The production of apples in 1965 was 36 (10^4 mts.) and it continued to increase for the going well. Therefore, it became 313 (10^4 mts.) in 2013. The production of apples had become more than eight times (**Fig.30**). The planted area of apples in 1965 was 60 (10^3 ha) and it increased little by little. As a result, it showed 173 (10^3 ha) in 2013. The ratio of the subsidy for the gross income of apple in farm households was the 60% level in 2011 (OECD, PSE/CSE Database).

Gül, M. (2006) investigated the technical efficiencies of apple orchard in three provinces in Turkey. These provinces produce 48% of Turkey's apple production. Using the questionnaire survey from farmers, the data of gross value product of apples, fertilizer, labor, machinery, pesticide and irrigation, etc. were collected. Particularly, the excess of potassium fertilizer was pointed out. The timing of irrigation and environmental factors has also an effect on technical efficacy. Also, according to the 2007 Statistics from the National Statistical Service, annual production of Turkey is about 2.3 million ton. About half of Turkey's apple production is supplied by the 5 provinces such as Isparta, Karaman, Antalya, Niğde and Denizli.

Additionally there is also a lot of production of the apple in Kayseri, Çanakkale, Konya, Mersin (The different name is İçel) and Bursa. About 80 percent of Turkish apple is produced at these 10 states with a lot of production (**Fig. 31**). In **Fig. 32** an apple field in TR622 (Gülnar district in Taurus) is given. Even though it is remarkably expensive to build, drip irrigation system is getting more prevalent in the region. According to 2009 data, 2 million 782 thousand tons of apple production in Turkey about 3% is produced in the province of Mersin[4)].

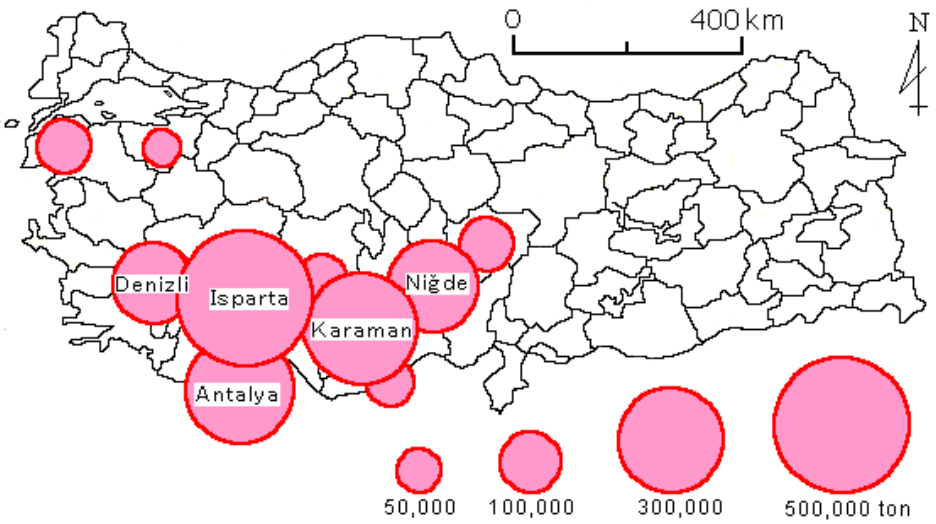


Fig.31 Production of apples in 2007

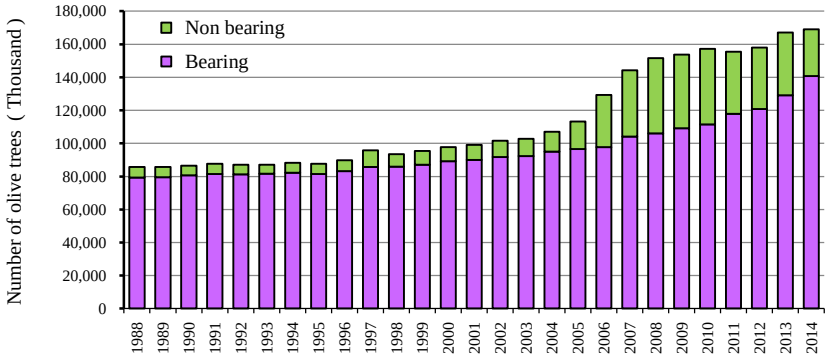
Source; SIS 2007 Agricultural Structure

Fig.32 Apple field in TR622 (Taurus (Toroslar) mountains) irrigated by drip system on August 8, 2015

3.4 Industrial crops

3.4.1 Olives (Zeytin)

The number of olive trees is increasing (**Fig.33**). It increases in olive forestation in the 21st century. The olive amount of production in Turkey was the fourth place in the world in 2012. Olive is grown widely in the area facing the Aegean Sea. Olives has the remarkable trait of biennial bearing in which a high yielding year and low yielding year came one after the other. Therefore, the repetition of the increase or decrease per year is conspicuous in olive production. The amount of production of olives was 94 (10^3 mts.) in 1965, but it increased to 1,676 (10^3 mts.) in 2013. The olive production increased in the long term and was increased 4 times in approximately 50 years. The planted area of olives spread smoothly and increased to approximately 2 times in about half a century (**Fig.34**). The areas with wider area harvested of olive are facing the Aegean Sea. The temporal changes of area harvested of olive aren't conspicuous (**Figs. 35-38**). In 2013, Aydın (TR321) has the largest acreage, 154,532 ha. There is more than 50,000 hectares of olive planted acreage in the following areas such as Muğla (TR323) 91,984 ha, Manisa (TR331) 91,604 ha, Balıkesir (TR221) 82,227 ha, İzmir (TR310) 98,016 ha, and Hatay (TR631) 51,685 ha. Further, there is also more than 10,000 ha of acreage in Gaziantep (TRC11) 42,093 ha, Bursa (TR411) 41,585 ha, Mersin (TR622) 38,053 ha, Çanakkale (TR222) 32,162 ha, Kilis (TRC13) 27,032 ha, Antalya (TR611) 16,533 ha, Osmaniye (TR633) 12,288 ha and Adana (TR621) 11,855 ha. The production of olive oil used by a dining table is increased a little in the long run (**Fig. 39**). The production of olive oil of the use besides that is increased in the 21st century. The color and the taste of the olive are different depending on production districts, but the black olive harvested in Gemlik in Bursa area often appears on breakfast and salad in Istanbul. Olive may also seem to be pickled plum for a Turk. Olive oil is poured over salad and stew, and it has been used in a cold appetizer widely.



Source; Ministry of Food, Agriculture and Livestock in Turkey

Fig.33 Number of olive trees in Turkey, 1988-2014

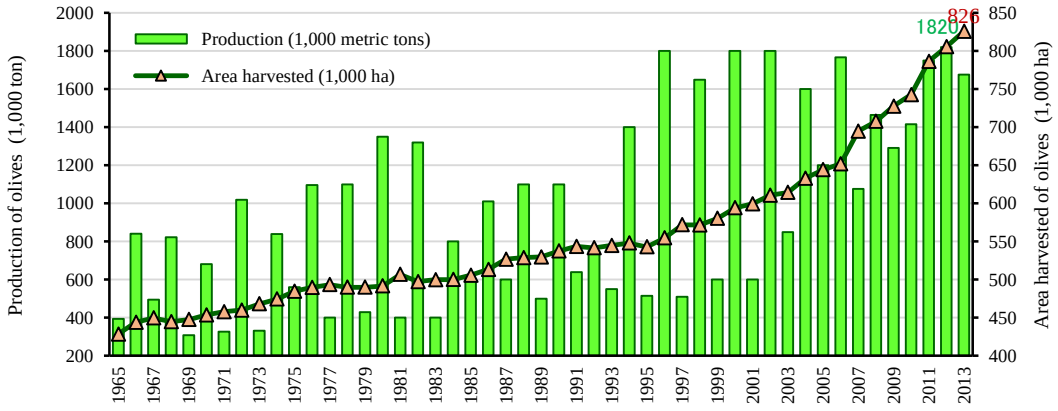


Fig.34 Production and area harvested of olives in Turkey, 1965-2013

Source: FAOSTAT

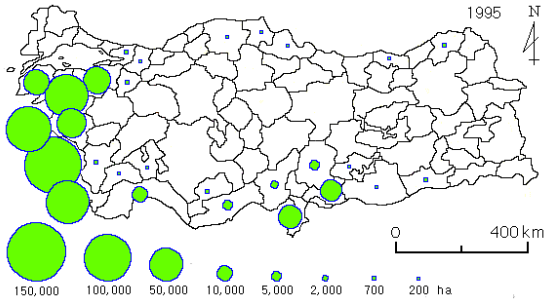


Fig.35 Area harvested of olives in 1995

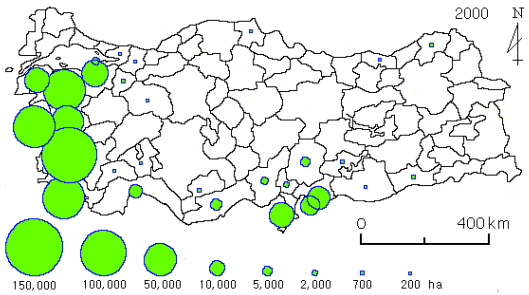


Fig.36 Area harvested of olives in 2000

Source: Regional Statistics in Turkish Statistical Institute

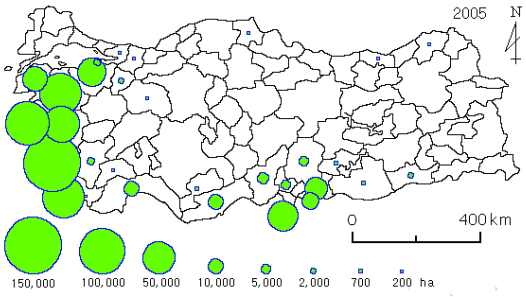


Fig.37 Area harvested of olives in 2005

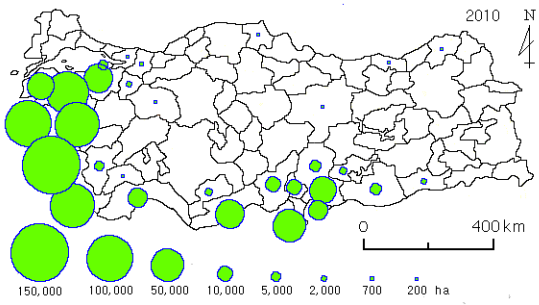
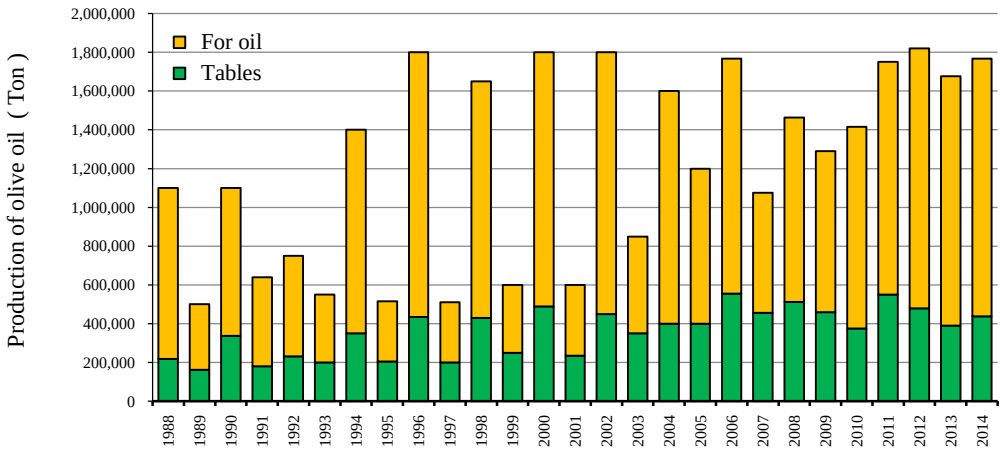


Fig.38 Area harvested of olives in 2010

Source: Regional Statistics in Turkish Statistical Institute



Source; Ministry of Food, Agriculture and Livestock in Turkey

Fig.39 Production of olive oil in Turkey, 1988-2014

With the support given in recent years, olive planting area is increased in 12.83% in Aegean Region, 4.85% in Marmara Region, and 72.27% in Mediterranean region. In the same period, planting area increased 74.32% in Eastern Mediterranean Region. Therefore, it can be expected that in the near future there will be a significant increase in olive production, especially in Mediterranean region[5]. In some cases, the planting areas of olive can be mixed with the lemon fields. Olive is a plant that needs annual precipitation of 650-700 mm. Less or irregular rainfall in the areas must be irrigated and in TR622 (Mersin) almost all (95.83%) is irrigated. The picture in **Fig.40** is a lemon and olive field in TR622 region. The soil and the climate conditions are suitable for the production of the both.

Fig.40 Lemon and olive field in TR622 irrigated by surface irrigation system on August 8, 2015

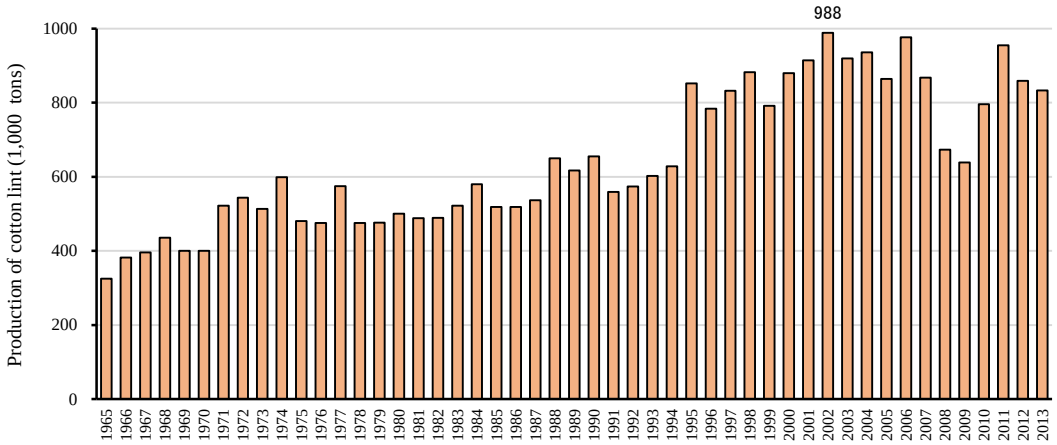


Fig.41 Production of cotton lint in Turkey, 1965-2013

Source: FAOSTAT

3.4.2 Cotton lint

The amount of production of cotton lint in Turkey was the eighth place in the world in 2012. The production of raw cotton in 1965 was 325 (10^3 mts.), and it continued to increase little by little. It exceeded 900 (10^3 mts.) on the way, but it recorded 833 (10^3 mts.) in 2013 (**Fig.41**). Cotton is the major industrial crop in terms of value, supplying seed for vegetable oil and fiber for textiles, a major export. Up to the 1960s, cotton cultivation increased rapidly following the introduction of new varieties and the extension of irrigation. The main cotton areas are on the coastal plains of the south and southwest. Subsidy was paid in accordance with production scale, the ratio was 16% of the gross income of cotton farmers in 2011 (OECD, PSE/CSE Database).

In southeastern Anatolia region, after consolidated regional development was considered in the1960s and the local development project (GAP; Güneydoğu Anadolu Projesi) has begun to be put into effect in 1977. 22 dams were built, irrigation farmland of approximately 1,800,000 hectares was developed, and a waterway and tunnel facilities for the irrigation were constructed. In the irrigation project in the Harran plain, irrigation farmland of approximately 150,000 hectares was developed, and raw cotton is grown at 70% of the irrigation farmland, and corn is cultivated at 20%, and vegetables and the fruit trees including tomatoes are produced.

According to Hisa (2002), after the end of 19th century, the variety of raw cotton derived from the United States was introduced into Adana and cotton

growing using tractors succeeded, and the variety of raw cotton was improved. Cotton cultivation in the Southern U.S. was considered to be a model in those days. The cotton growing in the neighborhood of Adana developed drastically in the late 20th century mainly due to the Marshal plan from U.S.A. at the mid-20th century. Furthermore, since a spinning mill established in 1864 in Adana increased, Adana city also developed as a cotton manufacturing town. Kang (2013) also investigated the transformation of cotton producing area, the Harran plain located on the Southeast Anatolia Region. The raw cotton is disseminated in April and is harvested from the middle of September to November. The production of the raw cotton in the Harran plain accounted for 8% of Turkey in 1994, rose to 14％in 2001 and 24% in 2011. The planted area of the raw cotton increased to approximately 3 times after the introduction of the irrigation waterway. The acreage of the raw cotton in 1994 was 45,867 ha, but spread to 117,948 ha in 2004, and to 130,455 ha in 2011.

3.4.3 Tobacco

Tobacco is a classic industrial crop in Turkey, but the output rose relatively slowly after World War II, reaching about 200,000 tons per year by the 1980s and 300,000 tons by the early 1990s (**Fig.42**). However, the production and area harvested of tobacco have been generally decreasing. European consumers' preference for Virginia tobacco was a factor in the slow expansion, although it is said that foreign investment in the domestic tobacco industry in the 1980s spurred production. However, both production and area harvested of tobacco have decreased rapidly in the 21st century. Smoking was prohibited in the inside of the bus and the public place after 1997. However, it is about the same that a Turk likes cigarettes. The ratio of the subsidy for the gross income of tobacco in farm households was approximately 18% in 2011 (OECD, PSE/CSE Database).

Turkish Monopoly Corporation (Tekel) manages the production and marketing of the cigarette. The public corporation manufactures and sells four kinds of cigarettes (*Yeni Rakı, Altinbas Rakı, Kulup Rakı* and *Tekirdag Rakı*) and also produces Camel and Marlboro (10 lira of Turkey, approximately 500 yen) under license. In 2004, private enterprise (Mey) purchased the alcoholic drinks section in the Tekel corporation and has begun to produce *Rakı* called *Efe*.

The brand of the cigarette which is the cheapest in Turkey is Samsung, and the price is 950,000 lira of Turkey (approximately 70 yen) in 1 packet (20 cigarettes).

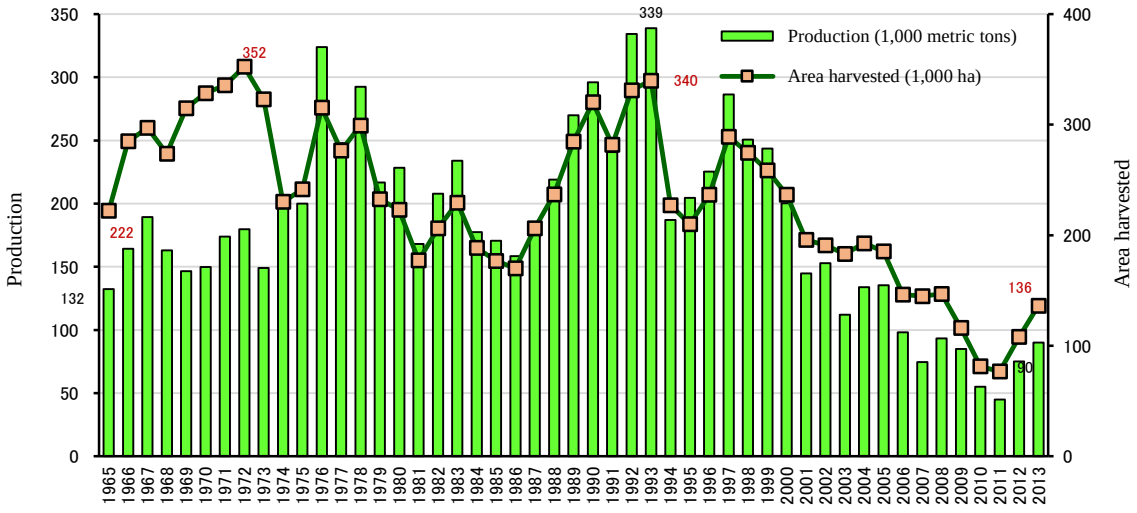


Fig.42 Production and area harvested of tobacco in Turkey, 1965-2013

Source: FAOSTAT

3.4.4 Tea (Çay)

The production of tea leaves in Turkey was the sixth place and Japan was the tenth in the world in 2013**. T**he production and the crop areas of the Turkish tea increased smoothly in the latter half of the 20th century and maintain a still constant scale (**Fig.43**). **Fig.44** shows the number of tea growers in Turkey and the number of the producers of the tea does not have the big change. The Turkish tea leaves are mainly used as tea, and there is the main cultivating area near Rize facing the Black Sea. Rize is also the name of the tea and is famous globally to some extent. Rize means the slant of the mountain and comes from "ριζα (riza)" of the Greek. The Black Sea district is an area with a great deal of green and much humidity and suitable for cultivation of the tea (**Fig. 45**).

About the origin of the tea cultivation, it is said that seeds of the tea were imported from the Orient at the end of 19th century. The tea came to be cultivated systematically in Rize and Artvin in 1918. A plantation of the tea was established in 1938 in the Rize district, and a tea factory has begun to operate in earnest in 1947. Up to then, famous Turkish coffee and herb tea had been generally typical drinks. After the 1950s, the production of tea began on a large scale, and it came to serve the demand for domestic tea soon. After the 1970s, the Turkish people came to drink tea at every place. The Turkish spiced tea is poured using a Turkish style teapot called the Çay Dan look. The people usually add a lot of sugar to tea and taste it with the glass (The height is approximately 5cm) of the slim tulip type at Çayhane and home. The people spread a saucer of the earthenware under the glass of the tea. A consumption tax of the spiced tea, Çay is 8% and is set cheaply in comparison with other products (15%).

In Turkey, the cooperative by the crops such as raw cotton, hazelnut, sunflower, olive oil, raisin was formed in every area after the 1930s. ASCU (Agricultural Sales Co-operatives Unions) is the high rank organization, and it has provided services such as preservation warehouses, processing, collection of cargo and packing, sale and the export to approximately 670,000 farm households. A share of ASCU (Agricultural Sales Co-operatives Unions) was 55% of the tea sale in 2008-2009.

Çaykur, General Directorate of Tea Enterprises constitutes the core of the Turkish tea business, runs 46 processed tea factories and products approximately 65% of tea leaves of Turkey.

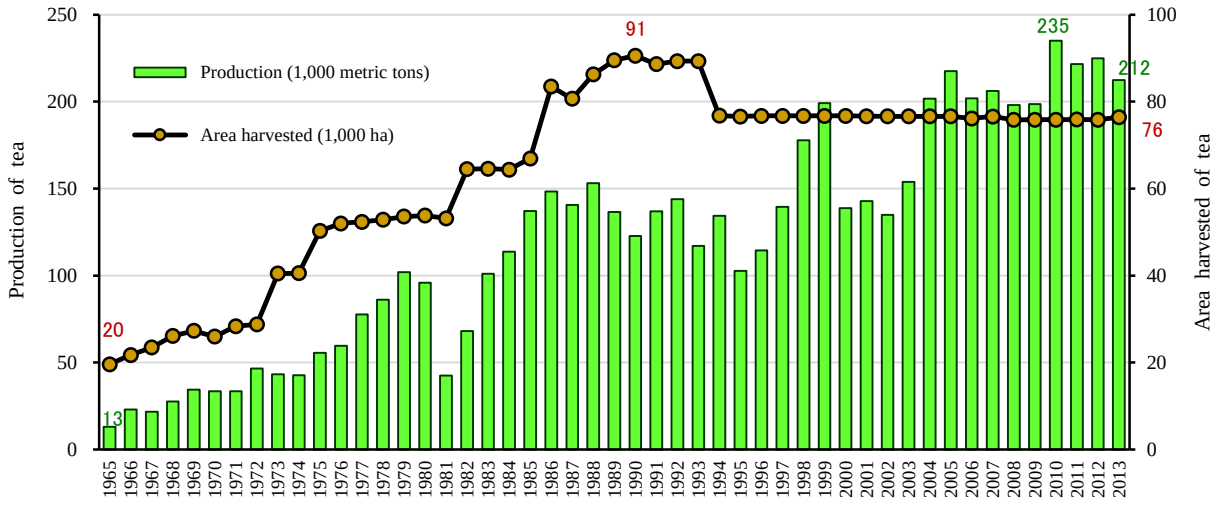
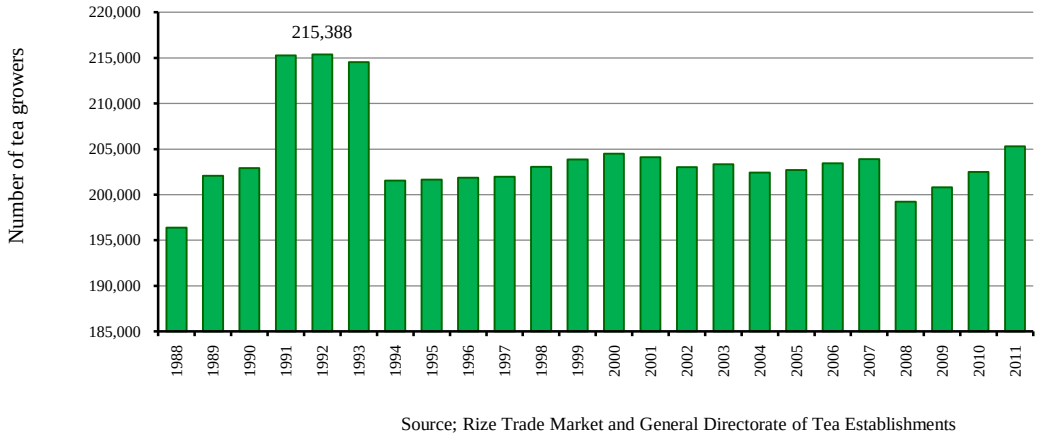


Fig. 43 Production and area harvested of tea in Turkey, 1965-2013

Source: FAOSTAT



Source; Rize Trade Market and General Directorate of Tea Establishments

Fig.44 Number of tea growers in Turkey, 1988-2011

Fig.45 Tea plantation of the Black Sea surrounded for morning haze

Source: http://item.rakuten.co.jp/dogal/cy500/

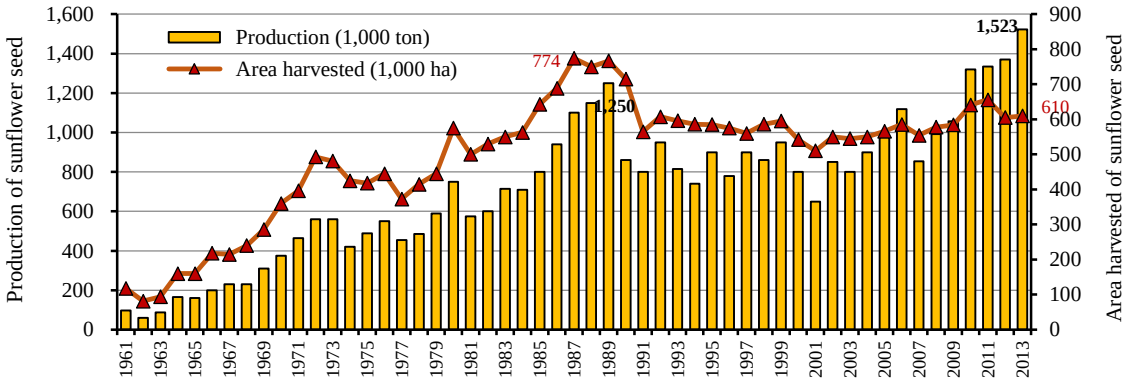


Fig. 46 Production and area harvested of sunflower seed in Turkey, 1961-2013

Source: FAOSTAT

Fig.47 Sunflower field in TR212 (Trakya savanna) on July 14, 2015

3.4.5 Sunflower seed

The planted area of sunflower and the harvests of sunflower seed increased remarkably until the 1980s. Approximately 20 years from 1990 were stagnation time. However, they recently increased rapidly. **Fig.46** depicts the changes in production and area harvested of sunflower seed in Turkey between 1961 and 2013 in detail.

A sunflower is grown to extract sunflower oil. The price of the sunflower oil is about 2/3 of olive oil, so sunflower oil is used mainly at most homes. Turkey is one of main producing countries of sunflower oil and it is also main consuming country. Turkey exports sunflower seed, but its export volume is less than import volume. A share of ASCU (Agricultural Sales Co-operatives Unions) was 32% of the sunflower sale in 2008-2009. The ratio of the subsidy for the gross income of sunflower in farm households was 10% in 2011. In addition to this, the subsidy was paid in accordance with production scale, the ratio was 16% of the gross income of sunflower farmers (OECD, PSE/CSE Database). Thus, 26% of the gross income of sunflower farmers was supported by agricultural subsidies.

Fig.47 shows a sunflower field in TR212 (Edirne). There have been some minor differences in cultivation time according to the geographic positions of fields and climate conditions, but it usually starts around the end of March or the beginning of April. Edirne is among the leading provinces in terms of irrigation opportunities (rivers, canals, and groundwater), fertilization, and modern agricultural tools. Sunflower fields are usually preferred in dry areas and at least one year of another crop (wheat) in the rotation. The city is also under the risk of water flood coming from the Maritsa River and water flood affects the crop rotation.

4 DISCUSSION AND CONCLUDING REMARKS

When we look back from long perspective to developments in Turkish agricultural sector and its spatial differentiations, we can realize the change in socio-economic changes. Demographic and governmental policy factors are also affecting the sector. Demographic factors like rapid urbanization and socio-economic expectations of the coming generations are becoming very dominant in crop production. This means fewer workers in the sector but higher production by improving agricultural machinery and agricultural technics. Of course, the tendencies of agricultural land use are under the effect of all these processes.

Governmental policies are also important factors that affect land use and spatial distributions of crop productions as much as demographic factors. In the future studies, the crop production should be also investigated by agricultural policies.

Regions in Turkey have agricultural land use and production potentials. This potential with the right production methods, irrigation systems, and financial/technical supports can be improved. Also, there can be leader regions according to the type of agricultural crops as well as leading the other regions. Lastly, the development of the sector is deeply depending on the yields of the producers, cultivators, and small farmers. Even though the international trade

of the agricultural crops and productions is difficult and strenuous in terms of international competition, it is considerably necessary so that all regions can sustain the agricultural activities themselves in Turkey.

NOTES

1) ITO (Istanbul Chamber of Commerce) publication, available at http://www.ito.org.tr/Dokuman/Sektor/1-99.pdf. (The last access 20.10.2015)
2) Mersin Directorate of Provincial Food Agriculture and Livestock, http://mersin.tarim.gov.tr/silifke/Lists/Haber/Attachments/5/Silifke%20%C3%87ilek%20%C3%87al%C4%B1%C5%9Ftay%C4%B1%20Sonu%C3%A7%20Raporu.pdf (The last access in 21.10.2015)
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4) T.R. Ministry of Interior, Mersin Governorate http://www.mersin.gov.tr/kurumlar/mersin.gov.tr/Genel/depo/TARIM%20MASTER%20PLAN-01.11.2011.pdf (The last access in 23.10.2015)
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